

Case mix and workload of patients seen at three private emergency centres in Cape Town, South Africa

By

Dr Zuraida Moolla

MBChB

Student number: MLLZUR001

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Supervisor: Dr Tyson Welzel

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Declaration

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Presentations arising from this study

None

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Definitions of terms

Acuity

- Level of severity of an illness

Boolean Phrase

- Type of search allowing users to combine keywords such as AND, NOT and OR to produce relevant results

Burden of disease or illness

- Effect on a population of health problems deriving from a type of illness, as measured by financial cost, workload, and consumption of resources

Case mix

- Analysis of types of patient presentations treated by a hospital or unit, used as the basis of funding, resource allocation, and clinical application

Emergency Centre

- Provides urgent healthcare 24 hours a day

Emergency Medicine (EM)

- The division of medicine that gives emergency care to patients

Hawthorne effect

- Activity in which individuals modify their behaviour in response to their awareness of being observed

South African Triage Score (SATS)

- The sum of factors that signal the degree of urgency for a patient's care

Triage

- The assignment of a colour-coded degree of urgency to decide the order in which patients are seen. Every presenting patient is assigned a triage code

Workload

- The number of cases attended to by an individual

List of abbreviations

CMI	-	Case Mix Index
CT	-	Cape Town
CTAS	-	Canadian Triage and Acuity Score
EC	-	Emergency Centre
ED	-	Emergency Department
MeSH	-	Medical Subject Headings
NHI	-	National Health Insurance
SA	-	South Africa
SATS	-	The South African Triage Score
WCP	-	The Western Cape Province

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Part A: Literature review

1. Background

Picture a private Emergency Centre (EC) in South Africa (SA) on a typical busy shift:

- The waiting room is crowded
- Staff can barely cope with the surge of patients
- Doctors and nurses juggle different acuities at the same time
- Patients and family agonise over the long wait
- Those liable for payment resent the “grudge purchase” high cost of attending an EC
- Staff members do not have time to make any improvements in the system while on EC duty
- “HELP me, *please!*”

The chaotic status quo of ECs present many challenges to healthcare planners and managers to better manage their ECs. Case mix data may provide valuable information to effect positive change within EC's using this data.

Third-party funders, either medical schemes or workmen's compensation, fund private ECs in SA; a small proportion are funded as out-of-pocket expenses. Private ECs are businesses and do not function solely for humanitarian purposes. They have to provide adequate emergency health care; ensure that appropriate resources are available; manage surge patterns, staff shortages and staff burnout amidst financial restrictions; and must still be financially viable.

Quite simply, case mix only looks at the types of patients seen in a healthcare setting. The development of case mix from a simple classification tool to its widespread utilisation in healthcare has been substantial, and beyond the scope of this literature review. Case mix will be discussed in a broad overview of the topic and show how it has been used internationally

and locally in various settings. This will allow the reader to appreciate how using case mix has evolved, and how healthcare planners can use and modify information derived from case mix to improve healthcare in different settings. The areas that will be focused on include case mix and acuity mix, workload, waiting times and patient flow, overcrowding, funding, resource allocation and utilisation. Fundamentally, case mix is a means to an end and not the end in itself.

Simplified case mix was used for the study undertaken in three private ECs to assist with future operational planning (see article in part B). It merely looked at the presentations, acuity mix and workload as determined by case mix.

In SA, case mix has not been used as extensively as it has been used internationally. Case mix measures are in their relative infancy and have been primarily focused on the public health sector. Case mix measures, with their various adaptations and applications, may be the key in determining healthcare status in both public and private health facilities. Case mix could be the missing tool that would address the gaps within the fragmented health system.

2. Objectives of the literature review

The objectives of the literature review about case mix in three private ECs in Cape Town (CT), the Western Cape Province (WCP), South Africa (SA), were to:

- Gather information on what has already been published on the topic
- Establish an general understanding of “case mix” and its usefulness
- Enable effective future healthcare planning in:
 - Workload
 - Adequate resource allocation
 - Funding
 - Staffing
 - Facilities and equipment

- Improvement in waiting times and overcrowding
- Facilitate a comparison of case mix findings in private and public EC facilities
- Promote analysis of the information revealed in a sample of three specific private ECs in a South African setting

3. Methodology

The University of Cape Town's off-campus library portal was the foundation of the research. Database sources were PubMed, Africa Wide via EBSCO host, and Scopus. Two search strings were followed per database, and results were pooled together for final review. Grey or non-electronically-indexed data and conference proceedings did not form part of the literature search.

3.1 Quality criteria

The Principal Investigator (PI):

- Determined the topic
- Read the titles of all results yielded from each database and string search
- Discarded irrelevant titles
- Obtained and read abstracts of the remaining articles
- Discarded irrelevant articles
- Checked for duplication in the titles of remaining articles
- Discarded duplicates
- Obtained and read the full articles of the items set aside in the six searches
- Discarded irrelevant articles based on the inclusion and exclusion criteria listed below
- Searched references in retained articles for missing references
- Added more articles to those collected for this review

3.2 Inclusion criteria

- All articles based or set in an EC, or accident and emergency unit, or Emergency Department (ED)
- All article types/publications, unless specified otherwise in the individual search
- Articles that included relevant research in both public and private settings
- Limited to a publication year between 2000 and 2017 to ensure information relevant to current EC trends and disease profiles were included

3.3 Exclusion criteria

- Articles that used case mix exclusively in an in-patient setting
- Articles in specialised units that only dealt with one type of complaint
- Non-English publications

3.4 Literature Search Strategy

For searches performed and discussed below the following limiters applied:

- Publication type: no limitations applied
- Source type: no limitations applied
- Subject : no limitations applied
- Date of publication limited to the years between 2000-2017
- Limited to the English language
- No further limitation in terms of age or sex were utilised

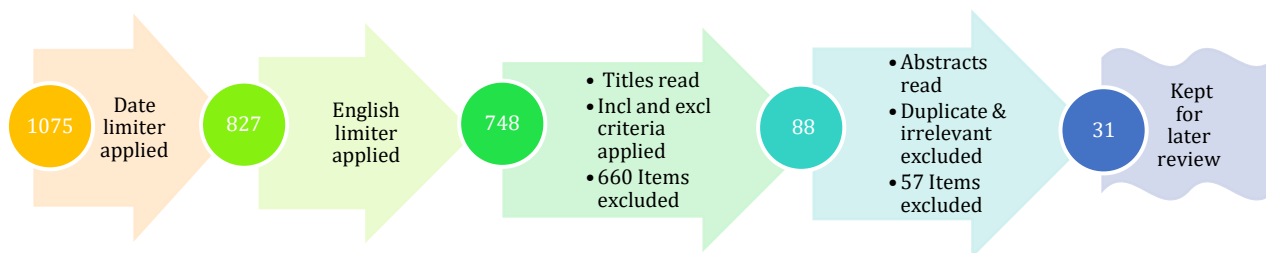
3.4.1 Pub Med central

Two search strings on the PubMed database via its standalone platform.

Search string 1

Accurate on 15th February 2017, an advanced search used the search string:-

(Emergency services, hospital) AND (case mix OR casemix OR case mixes OR diagnosis related groups)



Search string 2

Accurate on 28th January 2017, an advanced search used the search string:-

(groups, diagnosis related Medical Subject Headings[MeSH Terms])

OR (case mix OR casemix OR case mixes[MeSH Terms]) OR

(adjustments, case mix OR adjustment, case mix[MeSH Terms]) OR

(case mix OR casemix OR casemixes OR case mixes)

AND

(emergency departments OR hospital emergency services OR

emergency centres OR emergency centres OR emergency units OR

accident and emergency units OR emergency services,

hospital[MeSH Terms])

AND

(workload[MeSH Terms]) OR (workload OR workloads) OR (staff

scheduling OR staff allocation OR nurse allocation OR physician

allocation) OR (waiting time OR wait time OR waiting times) OR

(health care service delivery) OR (Hospital Planning[MeSH Terms])

OR (Hospital Planning OR planning) OR (Resource Allocation OR

Resource utilization OR Resource utilisation) OR (resource

allocation[MeSH Terms])



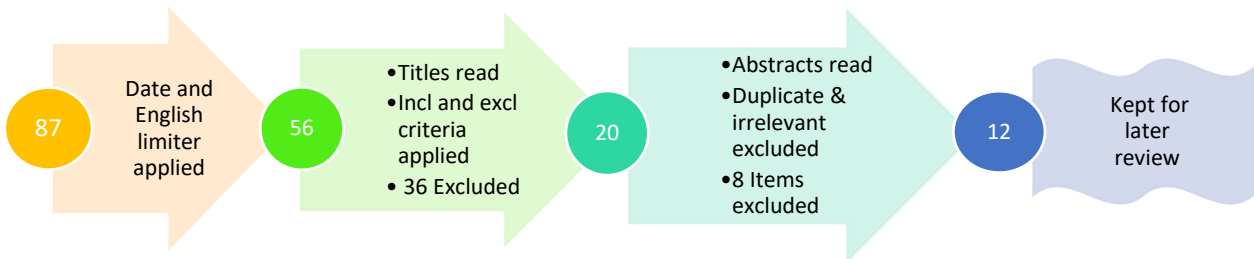
5.4.2 Africa Wide database via EBSCO Host

This study is set in Africa, and so choosing to search this website was to look for African research not found in other databases.

Search string 1

Accurate on 15th February 2017, a basic search used the Boolean Phrase:-

Emergency services, hospital AND case mix or casemix or casemixes
or diagnosis related groups



Search string 2

Accurate on 15th February 2017, the search mode selected was, “find all my search terms”:-

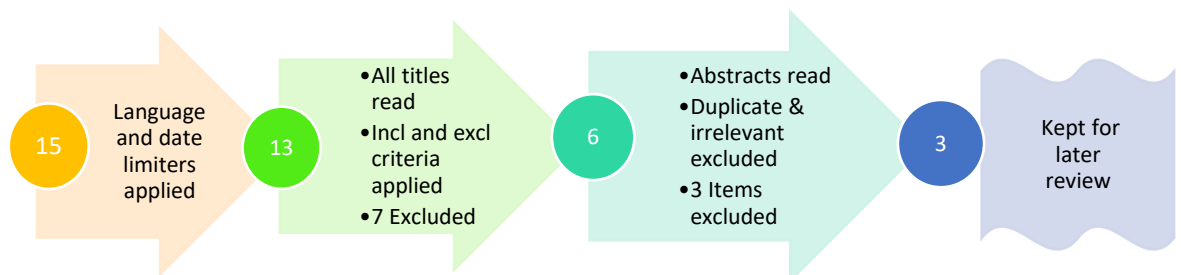
(diagnosis related groups OR casemix OR case mix OR casemixes OR case mixes OR case mix adjustments OR case mix adjustment)

AND

(emergency departments OR hospital emergency services OR emergency centers OR emergency centres OR emergency units OR accident emergency units)

AND

(workload OR workloads OR staff scheduling OR staff allocation OR nurse allocation OR physician allocation OR waiting time OR wait time OR waiting times OR health care service delivery OR hospital planning OR planning OR resource allocation OR resource utilization OR resource utilisation)

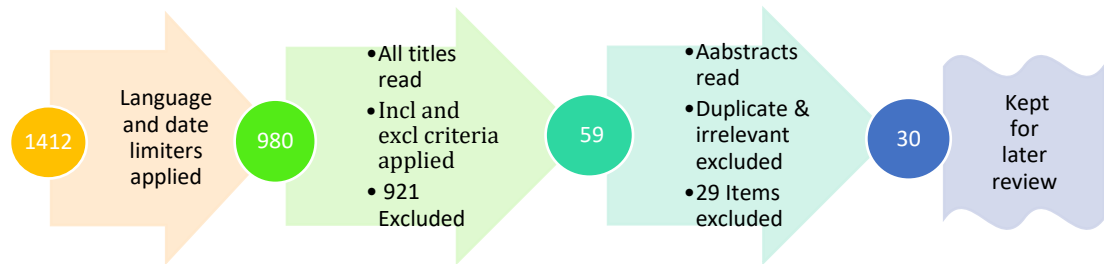


5.4.3 Scopus

Search string 1

Accurate on 15th February 2017, an advanced search used the search terms:-

(emergency services, hospital) AND (case mix OR casemix OR casemixes OR diagnosis related groups)



Title-Abs-key selected for all the search terms used above.

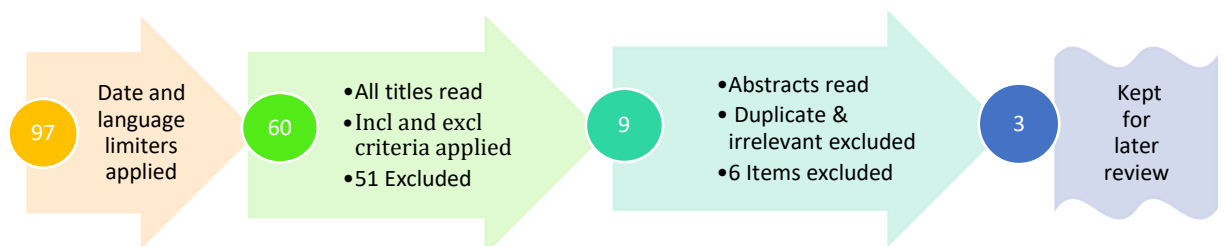
Search String 2

Accurate on 15th February 2017, an advanced search of the Scopus database used the search terms:-

(diagnosis related groups) OR (case mix OR casemix OR case mixes OR casemixes) OR (case mix adjustments OR case mix adjustment) AND

(emergency departments OR hospital emergency services OR Emergency centers OR emergency centres OR emergency units OR accident emergency units) AND

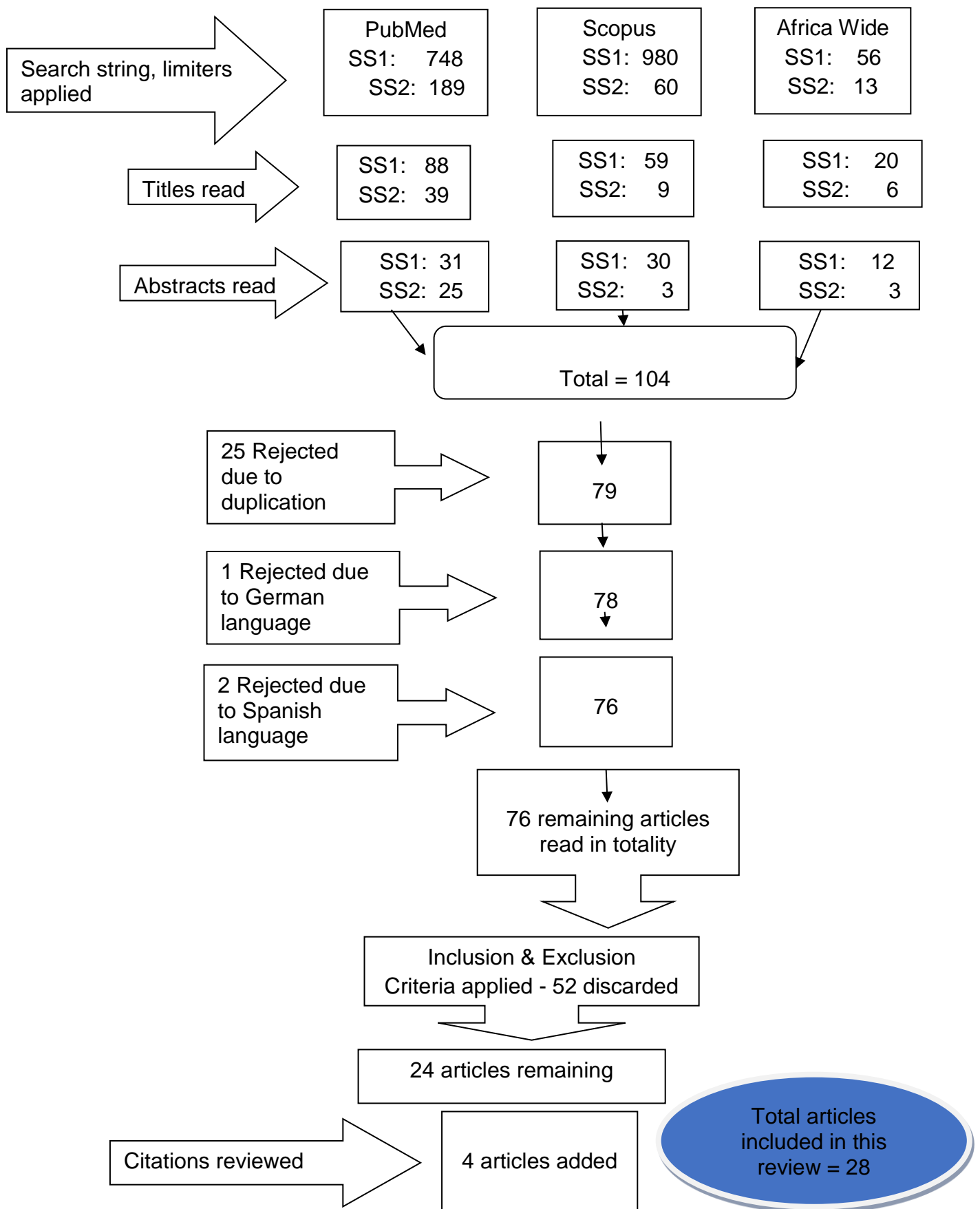
(workload or workloads) OR (staff scheduling OR staff allocation OR nurse allocation OR physician allocation) OR (waiting time OR wait time OR waiting times) OR (health care service delivery) OR (hospital planning OR planning) OR (resource allocation OR resource utilization OR resource utilisation)



3.5 Search results

This literature review used 28 articles. Flow diagram 1 (on the next page) explains the process.

Flow diagram 1



4. Summary of results

Table 1 shows key findings in reviewed articles. They appear in descending order of publication date for each category. If two articles shared the same dates, the article with the best level of evidence appears first. The table also shows the reference number in the bibliography.

Table 1

Ref	Year and author	Type of study	Key findings	Limitations
Case mix and acuity mix				
12	Harris et al. 2013	Prospective randomised data analysis	The case mix of ECs had a greater proportion of injuries and chest pain compared to acute-care facilities in the area.	Small proportion of attendees. Not generalisable due to large diversity within studied group.
17	Patil et al. 2013	Retrospective Chart review	50% of attendees to the EC had trivial complaints. This increased workload on staff.	Small sample size. Retrospective review.
22	Hanewinkel et al. 2010	Cross-sectional descriptive study	Template for EM development in Paarl and South Africa	Did not analyse the day of the week.
11	Carter-Storch et al. 2010	Cross sectional study	Complaint categories presented for patients in a Danish EC setting. Showed that 31 categories accounted for 93% of complaints and 99 groups for only 1% of patients' complaints.	Retrospective study. Ability to sort complaints into specific categories.
19	Tsiperau et al. 2010	Prospective Descriptive study	Paediatric cases form a large part of the patients seen in this EC in Papua New Guinea.	Observer Bias. Sample says smaller than was planned.

			Analyses of this subgroup revealed adequate management found in only 40% of cases.	Exclusion of sick children due to intervention by experimenter. Results skewed towards less ill children
14	Van Wyk et al. 2010	Descriptive retrospective study	Using the Cape Triage Score (CTS) to assign level of care, 47% of 2560 patients presenting after hours to George Provincial Hospital's EC required primary level care.	Retrospective review of medical records. Excluded incomplete charts, so it is not a true reflection.
10	Wai et al. 2009	Retrospective analysis of prospective data collection	Patterns of EC attendance and waiting times differed over the study time. Measures of EC complexity and workload required to determine staffing levels.	
21	Hodkinson et al. 2009	Observational study	Clear trends noted for patient demographics and temporal attendance patterns, which are important for resource allocation.	Study period was only one month.
20	Wallis et al. 2007	Prospective observational study	This study provided data to present a model for staffing and resource allocation in community health care ECs in Cape Town, South Africa.	Seasonal variations during data capture time.
6	Balnave et al. 2007	Descriptive study	There is a long way to go in terms of using case mix in hospitals. The effect of case	

			mix on funders, managers, and clinicians needs further exploration.	
13	Agouridakis et al. 2004	Prospective descriptive study	The case mix analysis of this EC revealed severe overcrowding due to non-urgent cases and inappropriate visits.	26% of cases were not included in the analysis due to inadequate triage data.
35	Dent et al. 2003	Retrospective review	Majority of presentations to an EC are not suitable for general practice.	Results not generalisable to other inner city hospitals
1	France et al. 2003	Review	The absence of a universal classification system makes international comparisons difficult.	
Workload				
23	Wise et al. 2014	Retrospective historical census audit	Use ratios to assist with staffing of nurses in ECs. Estimate nurse skill mix and patient presentations in all New South Wales ECs.	Results not generalisable due to the days chosen to do the audit. Low usable responses. Conservative approach used to calculate the bed occupancy.
7	Heslop et al. 2011	Discussion	Accurate service weights for nursing workload related to DRG needs to be developed and will be beneficial	Limited to Australian case mix development
16	Gedmintas et al.	Descriptive study	Tool can compare different EDs' workload and distribute	Tool not validated.

	2010		budget, staffing, equipment, and resources across EDs equitably.	Did not account for different types of hospital and locations. Access block was not taken into account.
24	Dreyer et al. 2009	Prospective observational study	They found that using the Canadian Triage & Acuity Score (CTAS) tool for scoring was not a good means of determining physician workload and physician staffing.	This study excluded Paediatric EDs. Hospitals were labelled rural or teaching or community.
18	Sprivulis et al. 2003	Retrospective Analysis	Low acuity patients form only a small, relatively constant part of this metropolitan ED's workload.	Systematic bias in calculation of low acuity presentations.
Waiting times and patient flow				
33	Pines et al. 2016	Retrospective data analysis	Waiting times associated with exogenous variables including age mix, case mix, and EC volume.	Only two years' worth of data analysed.
31	Aldridge et al. 2016	Descriptive Ecological Study	Evaluated waiting times, patient flow and workload in an uncrowded, private EC adjacent to another new one. Improved flow and waiting times as well as patient experience recorded. Controlling demand can have positive impact on waiting times and flow.	Holiday times may have presented seasonal variation. Accuracy of time not recorded. Prior advertising campaign for the new EC could have impacted attendance results.

32	Greene et al. 2012	Cross-sectional study	Better performance data of EDs relates to the urgency mix of patients attending. Longer waiting times when there were many emergency patients.	Public hospitals and only two private hospitals included that serviced public patients.
30	Bruijns et al. 2007	Retrospective and prospective cross-sectional study	Waiting times decreased dramatically with the introduction of the CTS.	The retrospective group was referred for admission whereas the prospective group was not.
34	Travers et al. 2006	Quasi-experimental design	Waiting times reduced when a senior physician was placed with a nurse at triage	Study days and control days only 10 days each, and only a few hours on those days. Possible Hawthorne effect.
8	Locker et al. 2005	Retrospective data analysis	Demographics, case mix, and waiting times of patients presenting to EDs changed over an 11-year study period.	Retrospective data collection. Change of service during the study time.
Funding , resource allocation and utilisation				
3	Ammar et al. 2013	Retrospective review	Accreditation used alone for reimbursement was inefficient; it was proposed to add inclusion of case mix and outcome indicators to accreditation models.	Miscoding. Used cost data and not real costs.
28	Ruger et al. 2007	Retrospective cross-sectional study	Accessible clinical factors can be used to improve accuracy of triage and resource allocation	Missing data reduced sample size by 10%

			amongst middle acuity triaged patients	for some of the analyses.
29	Pappa et al. 2006	Prospective descriptive study	Positive relationship between health care need and utilisation of health services in a mixed public-private health system	Study was in Greece which has more experienced personnel and better equipped. Heterogeneous dispersion of resources in relation to the population.
15	Ducket et al. 2001	Retrospective review of the literature	Evaluation of three models for single- payer health systems for funding hospital emergency services in terms of key products and cost drivers.	Proposed models need validation.

5. Discussion

Aspects of case mix appear quite extensively in the literature. To broaden and deepen our knowledge of the vital role that case mix plays in ECs, this review shows the importance of using case mix in planning for clinical application to workload; case-mix-based funding; resource allocation and utilisation; and improvement in waiting times and overcrowding.

5.1 Case mix and its uses within healthcare planning

The term “case mix” describes an analysis of patient presentations treated by a hospital or unit, used as the basis of funding, resource allocation, and clinical application. It is an important tool for grouping patients into meaningful categories.(1) It defines the “relative numbers of various types of patients being treated as categorized by disease related groups, severity of illness, rate of consumption of resources, and other indicators used for managing and planning health care services.”(2). It can determine the cost

per item of healthcare for billing purposes. Case mix also allows for comparison of hospital performance whilst using administrative data.(3) Despite the widespread use of case mix in healthcare, no standard format or indicator set exists for describing a hospital's or system's case mix.(1)

The United States of America (USA) introduced case mix measures in the 1970s.(4) The concept rapidly migrated to Australia, Western Europe, the United Kingdom (UK), Eastern Europe, Asia, South Korea, Mexico, Singapore, Brazil and South Africa (SA).(1) Malaysia held its second international case mix conference in 2003. Iran began implementing its case mix system in 2005.(5)

Significant work has been done on case mix indicators since the 1980s.(4) Most countries use such indicators to facilitate the funding process.(1) However, making use of case mix for international comparisons of healthcare is very difficult because of differences in coding and grouping methods internationally.(1)

The concept of case mix has evolved from being an endpoint, describing the mix of patients seen, to a tool and means to an end within different health sectors.(6) It has matured, in differing degrees in different countries, into the basis of funding, resource allocation and clinical application.(6)

Australia may be recognised as a world leader in terms of case mix due to the well-developed systems and infrastructure they have in place to support using case mix information for healthcare delivery.(6,7) Australia has used administrative data within case mix data to study different applications of case mix, including “adverse events, nurse-sensitive outcomes, case management, and workforce issues.”(7)

UK-based studies of case mix and waiting times have provided valuable information for determining the level of service achieved.(8) Patient

satisfaction is paramount to the success of a private health care facility; shorter waiting times improve patient satisfaction.

In many instances, practitioners that are not privy to a patient's past medical history and tests relate healthcare inefficiencies to uncoordinated care and duplication of health services. The US have shown figures of up to 42% of Americans having uncoordinated and inefficient care.(6) Case mix information systems can be used to improve care coordination. An example of this was noted in Sweden. Whilst not focusing on the individual patient, an aggregated view of the patient journey for different case mix types highlighted areas where discrepancies could occur.(6)

The Netherlands has a universal patient identifier. It could take this a step further by using a case mix system to obtain information for both in-patient and non-inpatient aspects of the patient encounter.(6)

5.2 Case mix and its applications in the EC

Case mix has many applications within a health care setting including ECs. Clinical data from case mix measures, of the severity and mix of illnesses, can help to measure categories in a population's burden of illness.(9) Data can determine if a facility can meet its triage outcomes in terms of the patients seen, the scope of the facility vs. patient presentations, and the referral patterns of that facility.(9)

If managerial and clinical domains of healthcare within a system are separate entities, they do not always appreciate each other's complexities. Using case mix indices based on clinical evidence can improve understanding in negotiating managerial changes.(6) Clinical accountability requires transparency to facilitate efficient healthcare provision.(6)

A Hong Kong study between 1999 and 2005 noted a change in their EC presentations with the introduction of a fee for EC attendances:(10)

Decreases

Overall attendances
Overall trauma cases
Staffing levels

Increases

Older patients
Medical presentations and admissions
Waiting times

This study highlights the necessity for constant analysis of case mix within EM and ECs to plan for resources that match the needs of an EC. A standardised list of complaints, and inclusion of complaint categories in the healthcare case mix, would therefore assist planners and providers for patient flow and resources.

A 2010 study in a Danish EC looked at the various presenting complaints that patients were referred with. It suggested that better management of patient flow in an EC and management of staff allocation requires an understanding of why patients are referred.(11) This study revealed that 93% of complaints could be classified into 31 complaint categories. Fewer than 1% fell into 99 groups.(11) A standardized list of complaints would provide interest to healthcare providers and planners. Similar studies have been undertaken in Canada, Sweden, Finland and Denmark using varying complaint categories.(11) Taking case mix a little further as was noted in these studies would allow for better planning within healthcare for patient flow and resources.

A London study looking at the case mix of patients in ECs compared to general practice or other acute care facilities noted that the case mix of EC attendances is different to non EC attendances.(12) The difference was related to the presentations being more complex and requiring more investigations not manageable in a general practice setting. Due to the location of this study, the attendees were younger, with a higher proportion of foreigners. The global increase in EC attendances would mean that EC staffing and resources would have to be matched accordingly.(12)

A study performed in Greece examined workload, case mix, and causes for overcrowding in their ECs. Results flagged important aspects of the health system which required improvements (13):

- An excessive case load of patients, higher than in other countries
- At least 40% of cases were inappropriate visits
- No universal triage tool used
- An underdeveloped primary healthcare system
- Inadequate outpatient clinics

This study showed the importance of quantifying the status of healthcare in a facility, using case mix as a starting point in planning

5.3 Workload

An Emergency Centre by its very nature is a milieu of unpredictability and strain. Determining EC care is dependent on workload and acuity of patient presentation.(14) Trying to distribute workload accurately in an environment such as this may prove to be very difficult. Workload is determined by the number of presentations, and by the acuity of the presentations and the complexity of dealing with a range of various pathologies. Workload and resource allocation overlap, so it is most important to include in calculations:

- Availability of staff and other resources
- Ability to manage any emergency presentation

The caseload or workload of an EC may be used in various administrative fields within healthcare, including “epidemiologic, workload planning and management, efficiency comparisons and the basis of payment.”(15)

In 2010, Gedmintas et al. proposed an Emergency Care Workload Tool to establish workload in the Australasia setting and facilitate correct allocation of EC resources and staff.(16) The tool used the Australian triage scale and disposition data. Patients with higher acuities as per triage, and those who were admitted, generated a bigger workload and higher resource consumption.(16) ECs having patient presentations that generated a higher

workload should have the correct equitable resources and staff available to manage the workload. Not validated at the time of the study, this tool has potential for determining workload in ECs and comparing different ECs.

A study of the case mix of patients in a district level hospital in Greece determined that a large part of the overloaded health system was due to non-urgent cases and inappropriate visits.(13)

An Indian study undertaken in the EC of a university hospital found that at least 50% of cases had trivial complaints. This caused increased workload on the staff, and necessitated increased resource availability to manage these attendances.(17) Most of the case mix patients were medical cases, followed by surgical cases, and a small paediatric case mix of 10%.

In contrast to these studies, Sprivulis et al. found that low-acuity presentations in the EC of a teaching hospital in Perth formed only about 10% of the workload. Excluding this patient group would not really impact on the overall workload of the EC, and costs would only be decreased by 2%.(18)

A Papua New Guinea (PNG) study found that 27% of the case mix in their EC were paediatric patients(19), as was noted in South African studies.(14, 20) The PNG study revealed that management of patients was inadequate in at least 40% of cases. The paediatric case mix needed more nurses with advanced paediatric skills. Many cases showed delayed assessments and treatment, and initial triage was not effective.

In Cape Town, SA, an EC divides its workload into emergent, urgent, and routine cases. Parameters for defining them include triage level, final diagnosis, special investigations and procedures done in the EC.(14)

A limited SA study in 2007 determined workload by acuity of presentations at four community health centres in the CT metropole.(20) The study showed predictable peaks of attendance that enabled matching staffing to the

requirements of that EC.(20) The study also found that each unit had a large number of paediatric cases, which necessitated planning to ensure each unit had paediatric capabilities.(20) This study was only a starting point for determining workload. (29) It did not use a tool, but just a simple estimation based on the cases seen during the study time.

The triage scale and the time taken to see patients determined the workload at George Provincial Hospital in WCP, SA. It equated to total patient hours per shift, and showed that workload was more than double on weekends compared to weekdays. The increase was attributed to patients who could be seen at primary-care level that was not available after-hours in George at the time of the study. Staffing was increased to accommodate the bigger weekend workload.(14) However, this information is not transferrable to ECs in private hospitals, nor to ECs of secondary and tertiary hospitals in WCP and SA.

Determining EC workload must include the number of doctors and nurses. Their “mental” workload is a very important factor, especially in SA, where injuries and trauma comprise at least 33% of cases.(21, 22) This value is much higher than in other countries. Figures of such cases in UK and USA are 8% and 12% respectively.(21)

5.4 Nursing workload

Determining nursing workload began in USA in the 1970s and in Australia in the early 1980s.(7) Research has been ongoing, but the literature shows very little reliability and validity in measuring nursing workload, particularly in ECs. In-hospital information is the basis of most of the information provided here.

Determining nursing workload has primarily focused on using time as the main factor. However, other factors play a role and should be considered:

- Patient type and acuity (10)
- Case mix of presenting patients
- Nursing intensity and direct nursing activities

- Indirect nursing activities including time for cleaning, washing hands, and speaking to family members

Cost of nursing services in USA equates to around 35% of all inpatient costs. Forty-five percent of Australia's nurses are in the public sector health force.(7) It follows then that costs related to nursing care need to be accurate.(7) An Australian EC used the triage scale to measure workload and resource consumption. Studies have examined EC nursing staff requirements, using individual patient characteristics to determine nursing workload.(16)

A USA review of nursing intervention may provide information on nursing workload, whilst Australia has used clinical costing units to determine nursing workload.(7) Australian studies of nursing practice have included "adverse events, nurse sensitive outcomes, case management and workforce issues".(7) Australia, New Zealand, Canada and Switzerland take nursing intensity into account when working out nursing cost weights in an inpatient setting for reimbursement to hospitals; but these too have deficiencies in terms of accurateness and completeness.(7)

Determining nursing workload remains a challenge due to the contemporary issues arising around nursing in ECs. There were many deficiencies in the sorting of nursing services in an assessment of case mix activity-based funding.(7) There was a need for accurate service weights determination for nursing costs, but no such measurement system exists. There wasn't much consensus within the nursing profession in trying to determine the workload measurement system.(7)

Increased nurse-to-patient ratios in in-hospital settings have shown negative outcomes for understaffed environments. Despite minimal studies in ECs, it follows that this is likely true for ECs as well.(23) A New South Wales census audit quantified the beds per nurse ratio in an effort to flag potential staffing problems within an EC.(23) Mandated nurse–patient ratios with balanced workloads are now being pursued by nursing unions to safeguard patient

outcomes.(23) Two Californian studies looked at outcomes based on ECs keeping to correct legislated ratios, but the results were not generalizable or similar due to differences in the populations studied.(23) Using ratios alone to staff ECs, without taking acuity or other measures into account, will also affect resource allocation of the nursing workload of ECs. This simple measure should be used to determine minimum staffing levels, rather than seen as a reliable tool for determining nursing workload in an EC.(23)

Australia has highlighted the need for measures of nursing-resource consumption and nursing workload in the in-patient setting. There is a similar need for those measures in both public and private EC facilities.

5.5 Physician/doctor workload

Canadian studies showed that work time increases significantly with higher levels of patient acuity, despite noting a greater variation in the distribution of time taken to see different patients.(16) They used the Canadian Triage Scale (CTS), and Predictors of Workload in the Emergency Room (POWER), to measure the time taken by physicians to see patients assigned with different acuities. Using CTS alone was not adequate in determining physician workload or downtime.(24)

5.6 Resource allocation and utilisation

Allocation in an EC is difficult. In addition to its requirements for handling regular daily and weekly surges in workload, the EC needs adequate resources, including staff, to manage unexpected emergencies.

Furthermore, public and private healthcare systems allocate resources differently. Most public system funding is based on fixed grants for ECs by a single payer as is seen in Europe, Canada and Australia(15). In SA a third-party funds private systems on a per-case basis for the service rendered.

The Australian healthcare system uses case mix extensively to determine resource allocation,(26) yet no broader tool exists for determining budget estimation, staffing and resource requirements.(16)

Triage scales allow for a system of sorting patients in an EC from lower acuity to higher acuity, and the use of macro data in case mix analysis. Data published in 2007 on a USA academic level-one trauma centre found that using certain clinical information within different triage categories could improve resource allocation. (28)

Canadian studies have shown some correlation between triage scale and resource, staffing workload and cost.(16) A study using a paediatric triage scale found good correlation with resource utilisation within an EC.(16) Further studies confirmed predictive validity for resource utilisation and costs within an EC.(16)

Basing their resourcing policy only on the number of presentations, not on case mix and workload, a Hong Kong hospital decreased its EC staffing when the total attendance levels dropped.(10) As the case mix changed and higher acuity patients were seen, despite the decreasing number of patients, the staffing was not adequate and waiting time in that EC increased.(10)

Despite most case-mix systems using triage variables for resource allocation, there are limitations in this. Determining resources required in a particular setting must take into account weaknesses in the interrater reliability of triage classification by different staff members.(15)

The use of disposition data for resource allocation provides incentive for higher admissions, which equates to more funding.(15) An English hospital found disposition alone to be a good measure of resource use. Two French studies used a different split of disposition data to assist with budget allocation.(15) This highlights that disposition data and triage parameters both have weaknesses as a measure for determining resource allocation and utilisation.

There is a paucity of data on a mixed public-private healthcare system. A 2006 Greek study found that healthcare was utilised as per the perceived need from the user, be it in a public or private setting, and not influenced by socio-economic status.(29) Non-emergent health-services utilisation was based on healthcare needs for the public system; private-system use was not only based on need.(29) Women and those of poorer health status frequented both systems. There was a pro-rich inequality of care for hospital visits, and a pro-poor inequality of care for GP visits.(29) There was, however, extensive use of the private sector and accessing of secondary health care. This lead to increased out-of-pocket expenses and needless over-consumption of hospital resources.(29)

The SA health system faces similar inequalities between public and private healthcare. This study shows that better off, fee-for-service-paying patients frequent SA private ECs. Since private hospitals are for-profit businesses, reliant on utilisation for their income, they allocate their resources differently.

Due to the heterogeneity of EC presentations, data from triage in ECs would provide:

- A good indication of the patients seen
- A starting point for resource allocation using acuity data and other relevant parameters

This literature review and study are the first ones to determine such parameters in three private emergency centres in Cape Town, South Africa.

5.7 Waiting times

In this era of increasing waiting times and overcrowding in busy ECs, patient flow and staff allocation and productivity need to be optimised.(21). Triage scales allow for ongoing measurement of endpoints for various presenting acuities. Waiting times may be impacted by staff training, patient acuity, total caseload, delays in obtaining special investigation results and patient

transfers.(30) Australia and New Zealand use time-based targets to try to limit the negative effects of increased waiting times and overcrowding.(31)

Greene et al. investigated the relationship between waiting times and emergency-department urgency mix in 158 hospitals studied in Australia. Longer waiting times and poorer performance were found in hospitals that had a higher number of emergency cases.(32) The acuity mix classifications, and recommended waiting times to have treatment initiated by a doctor, were based on the Australian National Triage Scale (NTS).(32) Interestingly, this study also showed that performance and waiting times were better for emergent and urgent cases if a higher proportion of non-urgent cases were seen. Hospitals situated in higher socio-economic areas had shorter waiting times for emergency cases, but this aspect had no effect on any other triage group. Only two of the hospitals were private, but they were also serving public patients, and so this study cannot supply data regarding public vs private hospitals. Also, some variances in this study make for unsatisfying comparability of EC performance.

Comparing waiting times between hospitals is a not a fair means of measuring performance, unless one adjusts for the demographics and acuity mix between compared units. The effect that waiting times has on health outcomes is a metric worth pursuing in future studies.(32)

A USA study of 424 hospitals found that waiting times and lengths of stay had associations with various exogenous variables. They included the volume of the EC, age mix, case mix, whether the hospital was situated in an urban or rural area, and whether or not the hospital was a teaching facility.(33) Using waiting times and overcrowding as a performance measure would not necessarily provide a fair representation. Stratification of data with exogenous variables, as mentioned above, would possibly allow for a better comparison.(33)

An older study done in Sheffield, UK, from 1993 to 2003 showed changes in the demographics of case mix and acuity mix of patients attending an EC.

Only towards the end of this study was the waiting time improving for minor cases, at the expense of major cases.(8)

A recent Singaporean study mobilised a senior Emergency Physician (EP) with the triage nurse and demonstrated a reduction of waiting times. Furthermore, one-third of the patients were discharged from the triage room and did not even enter the EC.(34) Ongoing studies and pilots in the UK, with variations of a see-and-treat system, are showing similar results as compared to the earlier mentioned study done in Sheffield.(34)

There are potential benefits of having an EP in triage and see-and-treat units. It can reduce overcrowding and workload within the EC, and allow more time to see higher acuity patients. This will improve patient satisfaction. Prolonged waiting times are directly related to patient dissatisfaction, regardless of the clinical care received.(34) The down sides are that:

- It takes away a senior EP from the EC to see to the higher acuity patients
- A system such as this has to include the case mix and acuity mix of the EC for it to work in a setting of more non-urgent cases
- This short study only mobilised the EP during busy times

Wai and colleagues found that, although the number of presentations decreased, waiting times and processing times increased due to staff reductions, increased workload of presentations, and a more aged population being seen.(10)

In CT, SA, using the Cape Triage Score for nurse triage in an overcrowded secondary-level public hospital resulted in dramatically decreased waiting times in the EC.(30) The decrease was significant for higher acuity patients, and less so for low acuity or patients assigned a green colour at triage. Target waiting times were not reached, but reduction was statistically significant. No triage had been performed prior to this study being undertaken.

5.8 Overcrowding

A universal increase in EC visits, together with associated organisational problems, has led to overcrowding.(13) Those working in ECs attribute overcrowding in the EC to lack of access to beds, staff shortages, access block, and ambulance arrivals. On the flip side, politicians and other groups attribute overcrowding to lack of access to primary care, use of ECs by frequent attenders, and because the EC is a source of free healthcare.(12)

Despite attempts to reduce overcrowding, it remains a huge problem in ECs. Internationally and nationally it has become associated with increased risk of poor quality, patient safety issues, negative patient outcomes, poor staff morale, patient dissatisfaction, and an impediment to providing safe and efficient health care.(10, 31, 33)

Studies in the Australasian setting have looked at reducing overcrowding by implementing time-based targets, redesigning ECs, reducing processing time, and improving hospital processes.(31)

Dent and colleagues looked at frequent attenders in a Melbourne, Australia hospital over a five-year period. They found that the presentations were not easily divertible to general practices; they did in fact require EC management.(35)

Decreasing the frequent attenders and improving primary care in this setting would not reduce overcrowding of the EC studied. Again, the finding is not generalizable to all settings as this particular EC had a high burden of chronic morbidity, due to the frequent attendees.

Overcrowding is a more of a problem in public ECs than in private ones.(31) In a 2016 Australian study, Aldridge et al. offered a novel way to look at the issue of overcrowding.(31) They defined under crowding as an EC in which demand is well below its capacity that allows for better functioning. They determined that if the demand for health services was controlled, this could have a positive effect on patient flow and overall patient satisfaction.(31) The

determining factor for an under crowded EC would be decreased presentations.(31)

In reality, achieving an under crowded EC is unlikely. Under crowding would mean fewer presentations, or increased infrastructure and staff. The funding and resources of many local and international public healthcare settings are already constrained. Private ECs, which are businesses, would not find under crowding with its less financial gain an attractive viewpoint. Improving waiting times, lengths of stay, and efficiency would likely be better and more feasible ways to reduce overcrowding in ECs. A balance would be required in terms of 'crowding measures' for an efficient health service.

5.9 Case mix-based funding

Case mix based funding despite being used in many parts of the world has not occurred in South Africa as yet. The use of case mix in funding models has been primarily in the acute-care setting. Greater than information systems and groupers, the complexity of case mix includes "cost weights, trimming algorithms, peer grouping and costing methodologies,"(6). Gross funding based solely on case mix – namely, the number of patients treated -- may be how Emergency Centres (ECs) are funded in certain instances; but this has many limitations for use.(15)

Introducing case-mix-based funding can improve the technical efficiency of a healthcare system, and the equity of payments.(25) However, this may not be equitable if more severely ill patients are seen in a particular setting, or if the healthcare setting has other disadvantages.

Australians have been using case mix funding since 1987. Theirs is a costing model which takes into account patient-care costing, with state-based funding of healthcare providers.(7) The nature of case mix funding has been revised many times and adopted in the Australian government's 2011 reform plan.(7) Its further applications include "productivity enhancement through

benchmarking and monitoring of resource utilisation patterns for in-patient services”.(7)

Within a national Australian setting, different states have applied case mix-based funding differently. For example, New South Wales based funding on equity in the distribution of resources, whilst Victoria based it on output.(6)

This shows that not everyone using funding based on case mix uses the same approach. Most payment systems overlook funding for ECs, or use inappropriate models that do not quite fit. Important factors to include in planning funding are:

- Teaching
- Research
- Preventative care
- Preparedness for emergencies and clinical stabilization
- Adequate staffing for disposition and inpatient care substitution until transfer to an inpatient ward occurs.(15)

Funding policies should ensure that the “balance of incentives is right, that there is adequate funding for the number and mix of patients treated, and that the costs are fully covered by any payment policy.”(15) Duckett et al. describe three alternative payer systems:

- Fee for service per case
- Fixed grants
- Mixed fixed/variable models.(15)

They conclude that output-based funding can provide the answer in allowing for incentives, and improving efficiency and accountability. The complexity of such a system is accepted; however, it should allow for fixed and variable payment models, within a policy and regulatory framework.(3)

Although Australia has used case mix-based funding for four decades, interestingly, there is limited knowledge about the impact of funding

arrangements. Also, not much comparison is known between Australian states that do or do not use case mix-based funding.(6) Victoria and South Australia use fully fledged case-mix funding models, whereas Queensland only implemented case mix-based funding in 2007.(6) Thus, mature use of case mix for funding purposes varies. Therefore, case mix-funding design must also recognise its limitations, as Australia has done. Risk-based assessments, with scoring for severity, are a better reflection of resources required, with a more equitable allocation of funds and resources.(26)

In USA, Emergency Department Groups (EDGs) have been used to account for procedure, diagnosis, age and disposition as variables in determining funding.(41)

In Lebanon, higher accreditation received more funding. Ammar et al. found this system inefficient and unfair.(3) Their study suggested that using accreditation together with case mix and output measures would improve reimbursement. Private hospitals were also found to have greater case mix index (CMI), and were better equipped, but not necessarily more efficient, than public hospitals.(3) The latter may be true in South African private hospitals, but lack of data does not allow for reliable conclusions.

Third-party funders such as medical schemes or workmen's compensation finance private ECs in South Africa; a small proportion is funded as out-of-pocket expenses. Private ECs are for-profit businesses and do not operate solely for humanitarian purposes. They have to:

- provide adequate emergency healthcare
- ensure that appropriate resources are available
- manage surge patterns, staff shortages and staff burnout amid financial restrictions
- be financially viable

5.10 The South African Setting

There is little information regarding patient presentation and disease patterns at different entry points into the SA healthcare system.(14) Effective decision-making about staffing requirements needs information about patterns of presentation, and case mix analyses of all ECs.(14)

Healthcare in South Africa can be accessed via:

- The EC of a public or private hospital
- The primary healthcare clinics of the public sector
- Public 24-hour community healthcare centre ECs
- General Practitioners

ECs are usually the entry points for users into any healthcare system and therefore deal with undifferentiated presentations. Emergency Medicine (EM) in SA has grown since the introduction of the EM specialty in 2004.(36) Informed planning of specialist emergency medicine improves staffing and expertise in ECs. Previously, junior doctors often staffed ECs without much specialist supervision.(37)

There is obvious inequality in terms of access and quality between public and private healthcare systems in SA.(9) Private ECs have adequate staff and resources in comfortable surroundings similar to those of European Health Care Systems.(38) The opposite is true of the South African public health system.

SA spends around 8.5% of its GDP on health care,(39) which is substantially more than countries with similar incomes.(40) The public and private healthcare systems contribute approximately 50% each. The problem with healthcare in South Africa is in the inequality of funding distribution. Fifty percent is spent on 16% of the population who seek care in the private sector. The other 50% is spent on the remaining 84% of the population obliged to seek care in the public sector.(41,42) The high cost of private health schemes restricts membership to wealthier citizens.(43) Such

schemes contribute around 45% to the total expenditure; the remaining 40% health expenditure is from taxation and 14% from out-of-pocket payments.(44) SA's healthcare system is categorised as a regressive health care system similar to the USA (and Switzerland before its recent reforms).(43)

South Africa has a quadruple burden of disease.(39,41) The country is also in a dire economic crisis.(45) The World Health Organisation's vision is universal, equitable, and efficient healthcare for all. Imperative accountability for efficient healthcare spend will help SA to achieve the 2030 Sustainable Development Goals implemented by the United Nations.(46)

SA's fragmented health system has not used case mix measures as extensively as other countries because it has focused primarily on the public health sector. Such measures with various adaptations and applications could be SA's key to determining and addressing its healthcare gaps in both its public and private health facilities.

SA's ECs are looking mainly at disease patterns in patients attending them, (14,20,22) with a focus on the acuity of patient presentations.(20–22) WCP has used case mix studies only in the public sector. (29, 30)

Public hospitals provide approximately 80% of acute care to the population.(14) Despite the numerous primary healthcare clinics in SA, particularly in WCP, patients still make use of hospitals even if they only require primary health care. This in turn leads to overcrowding of ECs, with the potential sequelae of increased morbidity and mortality.(14)

Public EC facilities in metropolitan Cape Town are also overcrowded and overburdened, partly due to increases in population in the last 10 years, and the burden of diseases prevailing in the communities which ECs serve.(21)

EC managers analyse the patterns of presentation to their ECs to better manage their work.(14) Traditionally WCP Government has allocated staff and resources according to the needs of that particular EC.(14)

A 2014 case mix analysis in an urban secondary hospital EC in George, WCP was done using the Cape Triage Score to make the best use of resources whilst reducing risks to patients.(14)

If primary healthcare facilities are not open after-hours, patients attend a hospital, as was shown in this study. (14) This study found presentation data to be consistent with other South African studies, with 74% of patients being adult and the remainder being paediatric.(14,20,22) The acuity showed 64% of presentations being triaged as green, 27% yellow, and fewer than 10% being urgent/emergent.(14) This study also confirmed the high rate of trauma presentations seen in most triage categories, except in the infant group. At least 47% of patients that presented after-hours required level 1 care that equates to primary level care. The case mix in this study pointed to an identifiable problem within this health region, namely unavailable primary level care after hours. Solving it would substantially improve their ability to provide a better health service. The location of this case mix study, however, may limit useful comparison with private ECs or other urban ECs.

Another SA study, done in an urban secondary public hospital EC in CT by Hodgkinson and colleagues, investigated patient demographics, acuity, waiting times, mechanism of referral patterns and outcome of patients.(21) They found that:

- Most patients presented during the day
- At least 30% of presentations were triaged as red or orange
- 41% self-referred
- 39% of cases arrived via Emergency Medical Services (EMS)
- 39% of patients resided in informal settlements within a 15 km radius of the hospital
- 25% of patients were admitted

- A further 25% were investigated in the EC
- The remainder were discharged
- Only 10% of presentations were paediatric, which is less than the other South African studies showed in both primary and secondary level hospitals.(14, 20, 22)
- Service delivery and efficiency improves if staffing is adjusted to temporal patterns of patient presentation

In addition, the study recommended development of strategies to manage lower acuity patients that were incorrectly utilising the hospital.(21) This study provided important information for resource allocation and planning. Improving flow in an EC improves its efficiency. Data from this study could be used in comparison with other public secondary level hospitals in Cape Town, but not with private ECs.

Investigating the status and case mix of healthcare within an EC provides necessary information for developing EM in naïve units, as noted in the 2010 Paarl, SA study. Information gleaned highlighted aspects of utilisation according to identified needs.(22) This was the first case mix study on a rural secondary level hospital in WCP. Data confirmed a high burden of trauma cases, followed by diseases of the gastrointestinal tract. Acuity findings were similar those in studies done in urban centres in SA.(22) 16.5% of cases in the Paarl study were admitted. There were higher self-referral rates by lower acuity patients that only required primary level care. The rural nature of that hospital and lower socio-economic status of patients resulted in higher use of EMS. This information cannot be generalizable to private ECs. Despite highlighting certain epidemiological, demographic and operational features, it cannot be generalised to include an urban private EC.(22)

A 2007 review, whose aim was to understand EM, described a cross-sectional study of patients presenting at four community-health centres providing primary level care in an urban setting in the Cape Town Metropole. Data collected elucidated acuity, temporal attendance patterns, case mix and

workload of these centres.(20) Approximately one-third of the presentation workload was emergent or urgent in nature.(20) This reiterates findings in the London study that indicate EC presentations are different to general practice and other acute care facilities presentation.(12) This study also highlighted a larger paediatric proportion of patients seen, with higher acuity in the paediatric subset. (20) No further studies have been done at CHC ECs, and the authors felt that this study was representative of all 24-hour CHC ECs in the Cape Metropole. There have been significant changes within EM in SA since the study done a decade ago, and so there is a need to repeat similar studies in similar settings. The findings of this study would not be generalizable to 24-hour CHCs elsewhere in SA.

Comparisons between ECs are difficult to make due to variety of presentations to different ECs.(13) Nevertheless, use of the South African Triage Scale (SATS) and other indicators can establish the needs of a private EC by determining its case mix, and then designing a system to facilitate resource allocation, staffing, and funding, amongst others.

6. Gaps for further research

Quantifying the mix of patients in both public and private hospital is required. This is where we would use case mix in its simplest forms:

- To contrast the two systems
- To understand the healthcare need of each system and allow for resource allocation as per the utilisation.

The South African studies that have been done are very limited and dated, so newer studies are required. EM has changed in the last decade and what was found then may not be relevant now.

The proposed National Health Insurance (NHI), which is still in its pilot phase, is intended to reform SA Healthcare. The complexities of its implementation have still to be described. However, it will rely heavily on a mixed public and private health system to ensure efficient, equitable resource use and

allocation to cater for all South Africans. Implementing NHI will necessitate major changes in existing systems.

7. Conclusion

In this Literature Review, we attempted to highlight some of the problems in the continuous running of an Emergency Centre. The synopsis began by determining what the problems are. It emphasised the differences in case mix factors between public and private emergency healthcare facilities. Then it cast a wide net across the world to harvest useful information about how different countries have tried to solve those problems. The synopsis then focused more on South African national and provincial details. Finally, it took a close-up look at the case study of three, private, and related emergency centres in a particular metropolitan setting.

The value of this study is that it can help many role-players in the:

- Supply and delivery of emergency medicine anywhere to act more mindfully in designing and implementing systems
- Allocation of resources in ways that benefit everyone who gives and receives emergency healthcare.

The discussion examined the strengths and limitations of different strategies that have been tried to solve the problems within different Healthcare settings. The conclusion of this literature review is that service delivery, administration and management, of both public and private Emergency Centres, internationally, nationally, provincially, and locally CAN be improved. Detailed surveys taken regularly of multiple factors in their case mix and workload can go a long way towards achieving those objectives.

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Part B: Manuscript in Article Format

I have chosen to write an article for the South African Medical Journal (SAMJ). In following the requirements by the SAMJ for preparation of the article, I have used different line-spacing options which differs from part A and C as per the requirements of the SAMJ.

1. SAMJ Article title page**Case mix and workload of patients seen at three private emergency centres in Cape Town, South Africa****STUDENT:**

Dr Zuraida Moolla
MPhil — Clinical Emergency Care
Emergency Medicine
MLLZUR001

SUPERVISOR:

Dr Tyson Welzel (01421805)
Division of Emergency Medicine
University of Cape Town

This study is in partial fulfilment of the MPhil degree (60-credit dissertation)

Keywords: Emergency Centres (ECs), case mix, South Africa (SA)

Total number of words excluding references, tables, figures and legends and including title page and abstract: 3429

Declaration:

I, Zuraida Moolla, hereby declare that the work contained in this assignment is my original work, and that I have not previously submitted it, in its entirety or in part, at any university for a degree. This work has not been published before, and nor has it been used for any other purposes except the student project required for fulfilment of the MPhil degree.

Signature: Z. Moolla

Date: 30/03/2017



2. Abstract

Objectives

To determine the case mix and workload of patients presenting to three private emergency centres in Cape Town.

Design

A prospective cross-sectional observational study was undertaken.

Setting and subjects

A sample of all the consecutive prospective patients that presented to three private emergency centres, namely Melomed Gatesville, Melomed Bellville, and Melomed Mitchell's Plain during the month of September 2013

Outcome measures

The outcome measures included the following:-

- Determining basic metrics across all three units over study time
- Determining the triage parameters for patients sampled across three units
- Direct time study of patients through unit
- Determining doctor-to-patient workloads
- Determining nurse-to-patient workloads
- Determining average number of patients receiving special investigations

Results

Third party funding was responsible for 91% of patients seen. The patient profiles consisted primarily of lower acuity presentations. There were clear peaks of attendance with lower acuity presentations decreasing after 10 pm. The majority of patients were discharged and very few required specialist follow up.

Conclusions

This study provides valuable information about the operational aspects of private Emergency Centres in the predominantly low socio-economic areas of Cape Town. Thus, it could assist with future planning of the management and running of similar Emergency Centres.

3. Introduction and Literature Review

Emergency Medicine (EM) is the division of medicine that deals with emergency care of patients. An important aspect of EM is the sustainability of the Emergency Centres (EC) that provide urgent healthcare 24 hours a day. The focus of the research was on three private ECs in the predominantly low socio-economic areas of Cape Town, South Africa (SA). The intention was to collect and analyse data that could assist with future planning of the management and running of similar ECs.

EM in SA has developed rapidly since its introduction and SA registration in 2003.(1-2) Prior to EM being a recognised speciality, emergency care was an extension of primary care and fell on the shoulders of family physicians and general practitioners. ECs now form an important part of health care in the Western Cape Province (WCP), and generally in SA. They are still undergoing transformation from primary care-based ECs to ECs equipped to provide emergency care.

Sources of hospital emergency-care in SA include:

- Public 24-hour community health centres with emergency units
- Public secondary and tertiary hospitals with their own ECs
- Private hospital ECs

Public hospital ECs provide acute care to approximately 80% of South Africans.(3) Private and public sectors each contribute 45% towards the health care spend. The distribution is not equitable because the private sector provides services to only 16% of the population.(4) This sector has resources similar to those of European health care systems.(5)

SA's quadruple burden of disease consists of the HIV/AIDs epidemic and TB; Non –communicable diseases (NCD); Injury and violence; and Maternal, neonatal and child health. This burden adds stress to an already constrained system, with predictions that the NCD aspect of this burden will be ever-increasing.(6) Primary health care, improved screening, preventative measures, and integrated, coordinated, health services require fortification to meet the increased health care needs of SA 's burden of disease.(6)

The WCP's 2030 health care plan requires:

- Health service delivery to be present for all before patient-centred care can be implemented.(4)
- Strategic partnerships with various role players.(4)

The private health sector with its many resources and infrastructure would play a huge part towards achieving the goals of the NHI, the SDG and WCP's healthcare 2030 plan.

The term "case mix" describes the type or mix of patients treated by a hospital or unit. It is an important tool for grouping patients into meaningful

categories.(7) Most of the very little available data about the case mix of patients presenting to ECs in SA has been done in the WCP and Cape Town (CT). (1,3,8,9) There is no published study to date describing the case mix of patients in private facilities in SA, the WCP, or CT. There is no data comparing the case mix between the public and private ECs in any South African setting.

A report by Stanger Hospital in KwaZulu-Natal indicated that, even though budgets may increase at the correct rate, if the case mix is not taken into account then the health needs will not be met adequately.(5)

There is limited recent information that quantifies patients seen at the majority of South African ECs. A 2014 study of macro data in a rural secondary hospital in George, WCP, showed that a large proportion of patients presenting to the EC went directly to a secondary level of service; they bypassed primary health care services. This information highlighted the need to improve the primary health care system in George.(10)

A 2010 review at a more rural EC in Paarl in the WCP indicated a large proportion of self-referred patients, and a high workload attributed to penetrating trauma(9). Although this study's information is relevant, it does not provide all the answers and cannot be generalised to a private hospital in CT.

In distinction, a 2009 review of the trends in patient demographics and temporal attendance patterns at an urban public secondary level hospital in CT provided important information for resource allocation and planning.(11)

A 2007 case mix study only looked at public sector units. Due to disparity between private and state-run hospitals in CT, the findings of that study are not transferrable to private health care facilities.(1)

A vital missing link in the establishment of health care services in CT is information on the private health sector in terms of acuity, case mix, and level of health care services rendered.

Currently, use of the South African Triage Score (SATS) guides the acuity assigned to each presenting patient by means of a triage code. Triage colour-coding in five categories signals degrees of urgency to decide the order of treatment of patients, from red (most urgent treatment required) to green, signifying that routine care is required.(12):

This study of three private emergency centres in CT provides a means of quantifying the acuity, case mix, and workload of patients presenting to these units. The aim is to determine whether the resources available in these facilities are adequate.

4. Methods

Ethics approval

Ethical approval to conduct this study was obtained from the Faculty of Health Sciences Human Research Ethics Committee at the University of Cape Town.

Study design, Study population and sampling

Prospective cross-sectional observation study looking at core indicators of the case mix of patients that presented to three private ECs, namely, Melomed Bellville, Melomed Gatesville, and Melomed Mitchells Plain. Prospective consecutive sampling was employed. Data was captured on all patients presenting from 01 September to 30 September 2013.

Data collection

A piloted data capture form (Appendix 1) was completed prospectively for each patient seen during the study period. All staff members were trained in a standard operating procedure for completion of forms.

Inclusion and exclusion criteria

All consecutive patients attending the facilities in the study period were included in the calculations. Some analyses excluded:

- Triaged-only patients
- Cancelled folders
- Folders with missing times

However, these exclusions were included in the overall reported figures.

Data management

The Principal Investigator (PI) collected anonymised, numbered, data capture forms and decoding lists, accessible only to the PI and data capturer after completion. A password-protected data-analysis workbook was completed using Microsoft Excel™ 2010 and backed up to a USB and an external hard drive. Captured data was compared for consistency by means of a 10% sample prior to data analysis.

The PI dealt with any incomplete or ambiguous data capture forms by using the decoding sheets and information obtained retrospectively from relevant patient records. If original data was incomplete, it was not analysed. Patient confidentiality was always maintained.

Statistical considerations, including data analysis plan

The data was analysed using the triage codes assigned to the patient as per the SATS, even if retrospectively they were found to be inaccurate. Time-dependent calculations excluded entries with missing times. If handwriting was illegible, a second person independent of the PI was asked for an opinion. If they could not agree, the original patient record was obtained and any disagreements clarified by looking at the original data. If the original data

was illegible, a third person was asked their opinion. If all parties were unable to read the handwriting, the data was not used in data analysis.

5. Results

Units 1, 2, and 3 indicate anonymised results. Calculated basic metrics and acuity mix of patients included only patients with recorded triaged parameters. The total excluded equated to 0.86%. Rounding totals use significant digits and may not add up to 100%.

Basic metrics of patients presenting to all three units over study time

Units 2 and 3 match closely in number of presentations, whereas Unit 1 makes up only 22% of the total. There is equal gender-distribution in all three units individually, and in pooled data. Children under the age of 12 make up 21.5% of all presentations.

	Unit 1	%	Unit 2	%	Unit 3	%	Total	%
Total Triaged	781	22.5%	1399	40.27%	1294	37.25%	3474	100%
Sex	Unit 1	%	Unit 2	%	Unit 3	%	Total	%
Male	366	46.9%	685	49.0%	674	52.1%	1725	49.68%
Female	415	53.1%	714	51.0%	620	47.9%	1749	50.35%
Payment Method	Unit 1	%	Unit 2	%	Unit 3	%	Total	%
Medical Aid	581	74.4%	1022	73.05%	1040	80.37%	2643	76.08%
Private (cash)	62	7.9%	157	11.2%	98	7.6%	317	9.12%
Workmen's Compensation	138	17.7%	220	15.7%	155	12.0%	513	14.8%
Not completed					1	0.08 %	1	0.03%
Triage Colour	Unit 1	%	Unit 2	%	Unit 3	%	Total	%
Blue			1	0.07%	1	0.08%	2	0.06 %
Green	271	34.7%	446	31.9%	616	47.6%	1333	38.37%
Yellow	374	47.9%	587	42.0%	466	36.0%	1427	41.08%
Orange	125	16.0%	340	24.3%	193	14.9%	658	18.9%
Red	11	1.4%	25	1.8%	18	1.4%	54	1.6%
Age	Unit 1	%	Unit 2	%	Unit 3	%	Total	%
< 6 weeks	5	0.6%	8	0.6%	6	0.5%	19	0.55%
6 weeks-1 year	53	6.8%	69	4.9%	109	8.42%	231	6.65%
2 years-5 years	42	5.4%	103	7.36%	154	11.9%	299	8.60%
6-12 years	36	4.6%	71	5.1%	90	7.0%	197	5.67%
13-18 years	27	3.5%	76	5.4%	81	6.3%	184	5.30%
18-65 years	559	71.6%	917	65.5%	807	62.4%	2283	65.72%
>65 years	59	7.6%	155	11.1%	47	3.6%	261	7.51%

Table 1: Macro data of all triaged patients

Acuity

Table 1 presents the acuity mix. Green and yellow triage categories are lowest-acuity patients, and signify 79.45% of all presentations. Unit 2 has

close to 5% more orange-category patients than Units 1 and 3. In 42.29% of cases triaged, a discriminator was used to change the triage code to a higher level of acuity.

Temporal patterns of attendance and workload

Total throughput of the three units was 3505 patients, with a mean total attendance of 39 patients per 24 hours. New patients presented 79%, whilst follow-ups made up 18.4% of all presentations. The 1.5% of triaged-only patients and the 0.83% with cancelled folders were not seen by a doctor and did not form part of this calculation. Fig 1 depicts the number of patients presenting by hour of day in different triage categories.

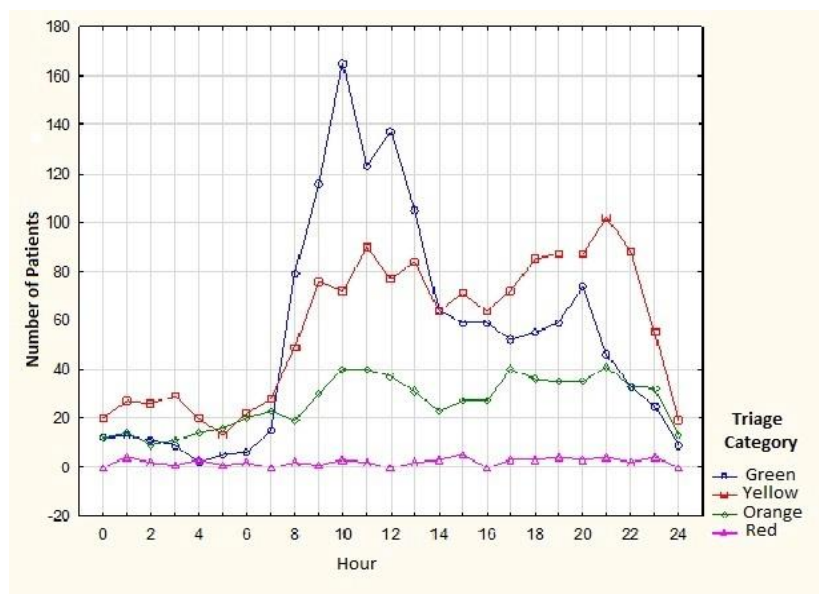


Fig 1: Patient presentation by hour of day for different triage categories of pooled data

Figs 2, 3, and 4 indicate workload determined by number of presentations, patient-to-doctor ratios, and patient-to-nurse ratios respectively. Indications are by hour of day and day of the week for each unit. All three units had similar temporal trends by hour of day with two peaks noted at 11 am-2 pm and 7 pm-11 pm.

Unit 1 had an additional enrolled nurse (EN) on weekends until midnight. Unit 2 had an extra doctor on Mondays 9 am-5 pm, Tuesday to Friday 9 am-3 pm, and weekends 11am-11 pm. Nursing-staff numbers remained constant at Unit 2 at all times, including an extra professional nurse (PN). Unit 3 had an extra doctor between 11 am and 11 pm, and an extra PN on weekends.

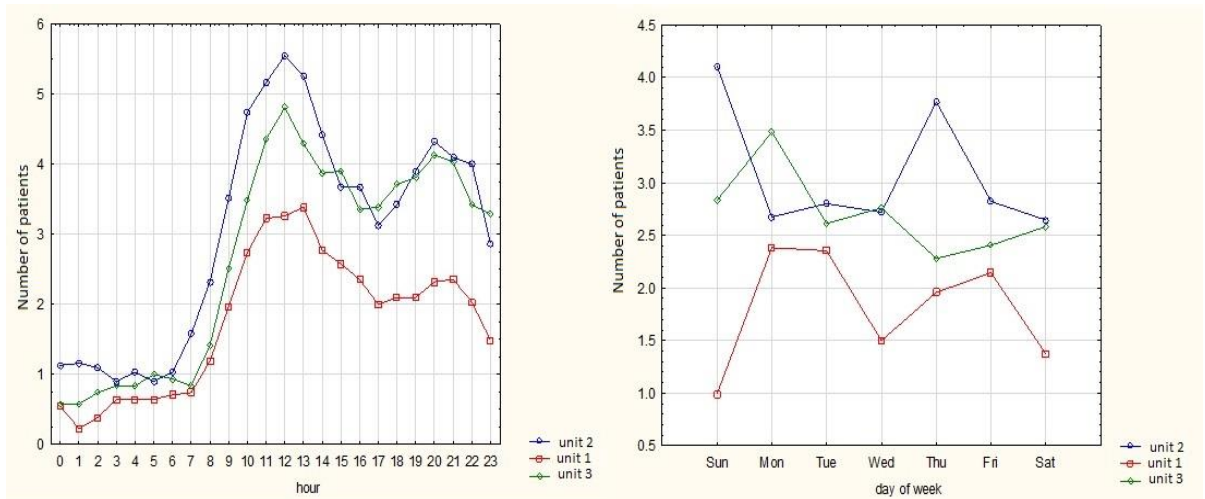


Fig 2: Number of patients by hour of day and day of week per unit

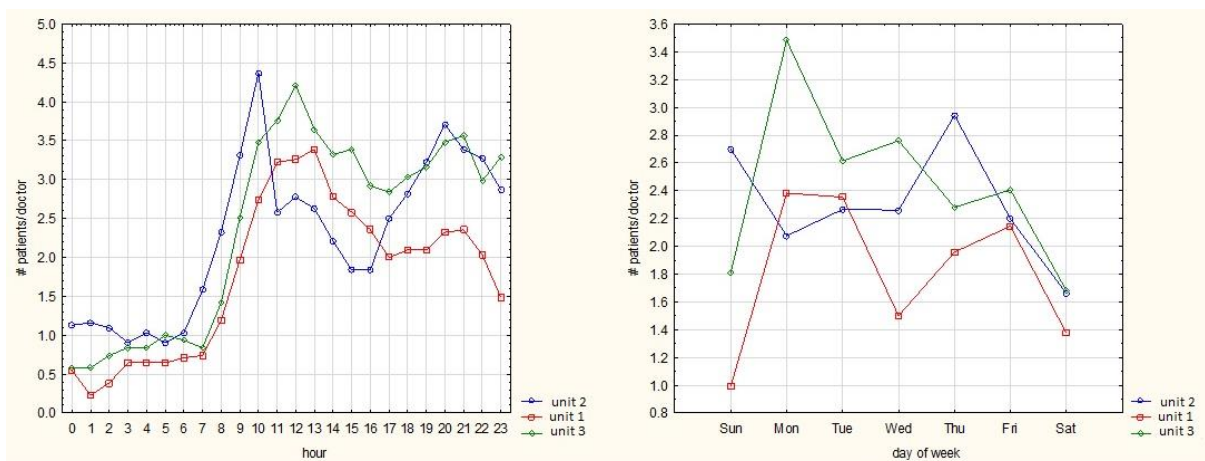


Fig 3: Ratio of patients : doctor by hour of day and day of week

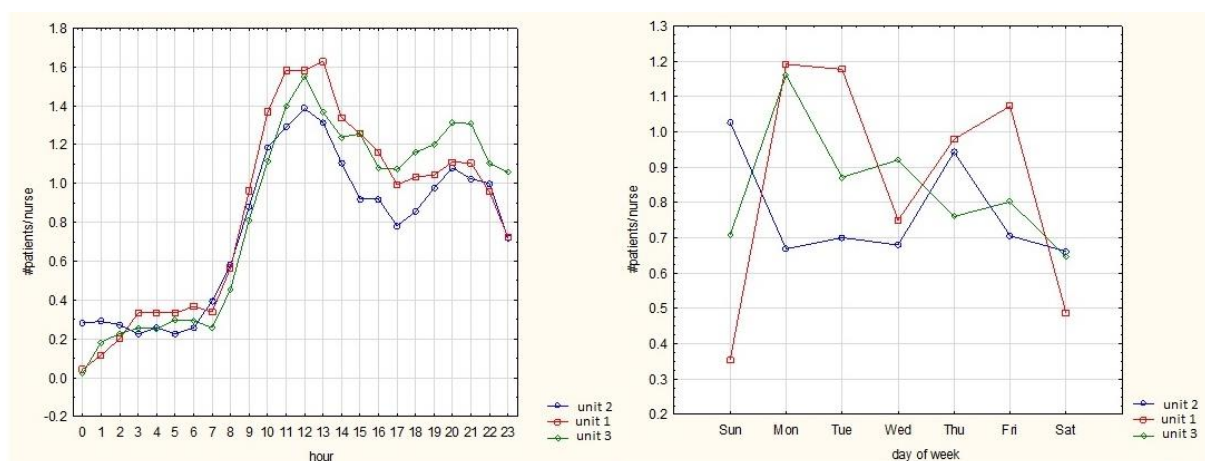


Fig 4: Ratio of patients : nurse by hour of day and day of week

Patient Presentation by speciality.

This calculation excluded 2.37% entries.

Specialities	Unit 1	%	Unit 2	%	Unit 3	%	Total	%
Medical	264	34.3%	452	32.9%	356	27.8%	1072	31.32%
Surgical	144	18.7%	315	22.9%	255	20.0%	714	20.9%
Polytrauma			15	1.1%	1	0.08%	16	0.5%
Paediatrics	137	17.8%	246	17.9%	351	27.4%	734	21.4%
Orthopaedics	116	15.1%	259	18.9%	162	12.7%	537	15.7%
Obstetrics and Gynae	19	2.5%	30	2.2%	27	2.1%	76	2.2%
Psychiatry	18	2.3%	18	1.3%	31	2.4%	67	2.0%
Trauma	72	9.4%	38	2.8%	96	7.5%	206	6.01%
Total	770		1373		1279		3422	

Table 2: Major speciality category of patient presentation

The Paediatric presentations have not been duplicated and have not been added to any other categories in Table 2. A further analysis of paediatric grouping can be seen in Table 3, with an adult comparison.

Specialities	Paediatric		Adult	
	Number	Percentage	Number	Percentage
Medical	479	65.3%	1072	39.88%
Surgical	142	19.3%	714	26.56%
Poly trauma	2	0.3%	16	0.6%
Orthopaedics	55	7.5%	537	20.0%
Obstetrics and gynae	1	0.1%	76	2.8%
Psychiatry	0	0%	67	2.5%
Trauma	55	7.5%	206	7.66%
total	734		2688	

Table 3 : Paediatric and adult comparison within different specialities

Adult and paediatric presentations have noticeable differences, with more orthopaedic cases and fewer medical cases amongst the adults. Unit 1 did not see any polytrauma cases, and Unit 2 saw a disproportionate number of polytrauma cases in comparison with the other two units.

Special investigations

Approximately one-fifth of presentations required radiology and/or pathology tests, primarily for medical conditions. Tables 4 and 5 indicate Special Investigation data.

Type of Special Investigation	Number of patients undergoing each specific Special Investigation	Average percentage of patients requiring Special Investigations
X-rays	807	23,6%
General pathology	643	18.8%
ECGs	480	14.0%
Trop I	156	4.56%
Mobile X-rays	41	1.2%
Ultrasounds	25	0.7%
CTs	27	0.8%
MRI	3	0.09%

Table 4: Average number of patients receiving special investigations

Major Diagnosis Group	X-rays	Mobile X- ray	U/S	MRI	CT	ECG	Pathology	Trop I
Medical	30.2%	88%	24%	100%	33%	76.7%	64.7%	89.7%
Surgical	14.6%	12%	40%		26%	12%	20.4%	10%
Polytrauma	1%				4%		0.6%	
Paediatrics	17.5%		4%		7%		5.6%	
Orthopaedics	27.8%		4%			4.6%	1.6%	
Obstetrics and Gynaecology	0.4%		24%			0.4%	3.7%	
Psychiatry	0.4%					4.8%	2.3%	1%
Trauma	8.1%				22%	2%	1%	

Table 5: Breakdown of special investigations by Major Diagnosis Groups

Direct time study

This calculation excluded 2.5% of entries. All time-based calculations were calculated from the earliest time of contact, either by the:

- Admin clerk opening the folder
- Triage nurse
- Doctor seeing the patient

Data produced was skewed in most time-based calculations (Fig .5) and results were reported on using the median.

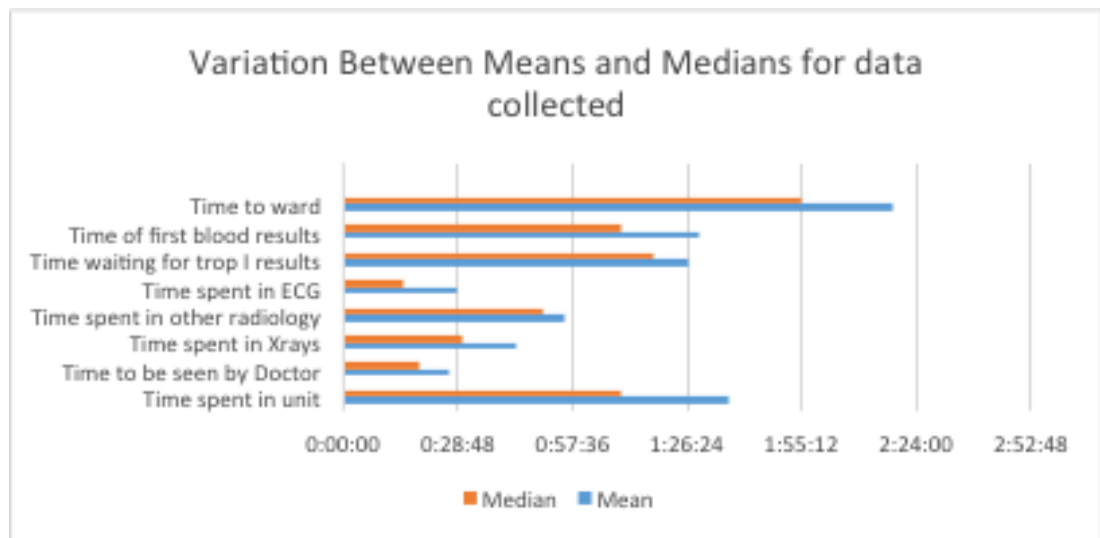


Fig 5: Variations between Median and Mean for time based calculations

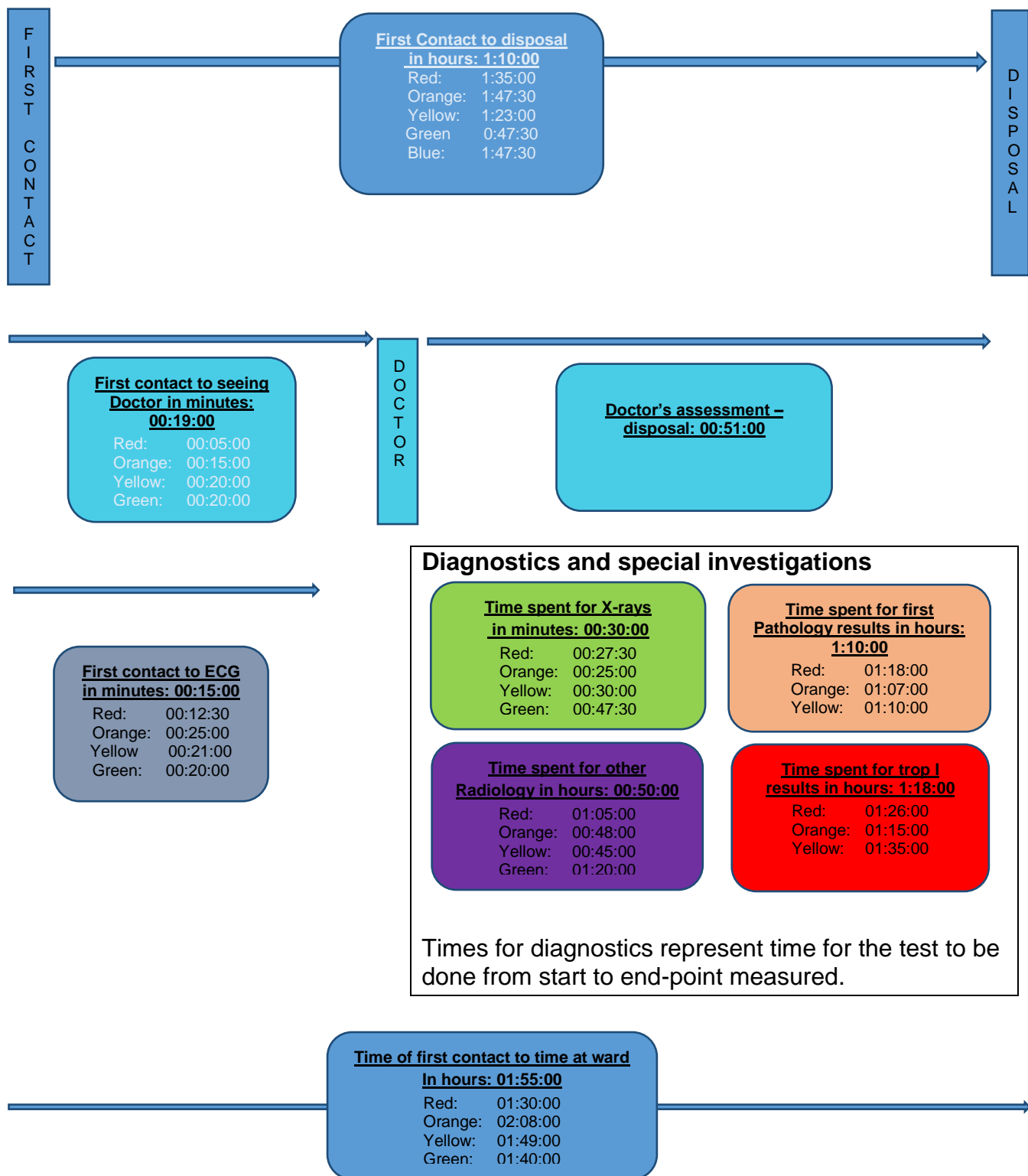


Figure 6: Direct Time study of patients

Disposal

Disposal data excludes patients who were dead on arrival (DOA), but includes those who died in the unit.

Despite the average admission rate being 18.12%, there is a clear difference between admission rates at the individual units; Unit 2 had a higher admission rate; Units 1 and 3 were more evenly matched. The pool of doctors servicing each unit remained the same, with very few doctors working in only one particular unit. The hospital at Unit 2 is equipped with more specialities and super specialities within the Melomed group, and served as the referral hospital for Units 1 and 3. Unit 3 has basic speciality cover with no super specialities.

6. Discussion

This study provides data on case mix in three private ECs, two of which are uniquely located in the poverty-stricken “Cape Flats” of the Cape metropole. The third is in a more affluent area, yet still drains surrounding impoverished communities and a part of the “cape-flats”. These ECS provide healthcare to lower socio-economic-class patients who belong to lower-income medical schemes. Lack of data means that:

- It is unknown if these results will be comparable with public urban ECs in CT and WCP
- Comparisons of results with other private urban ECs in CT and WCP are not possible at this stage
- It is unknown if the burden of disease spectrum in these ECs is more than those seen in other urban private ECs in CT
- Comparisons can only be made once more studies are done

Patient profile

Paediatric attendance patterns were similar to those at local community healthcare centres,(1) and more than those at secondary public hospitals.(11) This could be because there is a dedicated paediatric hospital in CT, which reduces the paediatric burden on urban secondary hospital ECs in CT. The data suggests that a large number of the working class presents to Units 1, 2, and 3 for emergency care. Numerous paediatric attendances point to the fact that the surrounding community relies on the units for paediatric care and that paediatric capabilities are necessary. The large paediatric proportion of patients could be due to a community with younger families.

Healthcare in the private setting is very expensive. The majority of patients presenting relied on third-party funders -- either private medical schemes or Workmen’s Compensation -- to cover the cost of the visit. These two equated to 91% of cases. Out-of-pocket payments funded the remainder.

Acuity

As was noted with other South African studies, the majority of presentations were in the yellow-triage category (1,9,11), followed by green, orange and

red. The proportion of red and orange patients was marginally less than in other secondary level public ECs. These units had a larger proportion of green patients similar to those seen at Community Health Centres (CHCs) and fewer than those seen at secondary level hospitals.(1,9,11) Presentations to private ECs are self-referrals due to convenience and perceived expectation of better care. The high number of yellow presentations indicates patient confidence that private ECs are better equipped to deal with their urgent/emergent medical complaints.

Temporal patterns of attendance and workload

The two daily peaks of attendance and increased workload were similar for each unit. The first peak represents those requiring medical services who are unable to go to work/school. The second peak represents working-class patients who use the facilities after work because of the convenience of services offered after hours, rather than the emergent nature of the presentations.

No clear pattern existed in attendance peaks by days of the week. However, the impact of increased staff in Unit 2 compared to Units 1 and 3 indicates a need for adjusting the staffing patterns to match the workload in each individual unit. Sundays, Mondays and Thursdays seemed busier. The majority of General Practitioners (GPs) are closed on Sundays and most units are busier on a Monday, as was seen in the South African studies.(1,11) The Monday peak possibly represents those who:

- were unwell over the weekend and waited until Monday to present
- did not attend work and required a medical certificate

The Thursday peak cannot be reliably explained.

The peak of green-triage patients followed the temporal peaks of attendance. Yellow- and orange-triage categories had similar attendance with peaks noted between 12 pm and 10 pm, which remained steady at that time. The fall in the number of green-category presentations between midnight and 7 am confirms the benign nature of these presentations. The highest presentation at this time was in the orange category, followed by yellow, and indicates a more appropriate use of ECs during the night.

Direct time study

Most patients were seen sooner than the desired waiting times set out by the SATS.(13) There was a slight delay in the time the doctor saw orange-triage patients by five minutes, possibly due to nursing intervention before alerting the doctor about the patient's presence. Green and yellow categories were seen much quicker than the desired time of less than 240 minutes. Public ECs have much longer waiting times, particularly for low priority patients.(11–13) Private hospitals are a business and patient satisfaction is paramount to their success; staff see patients timeously. The public system is constrained, and has higher acuity patients with fewer resources to manage them.

Disposal

Approximately one-fifth of patients are admitted. Transferred patients also imply admission, as they are unable to be discharged. This figure is less than that seen at an urban EC in the Cape metropole(11). ECs have the ability to perform special investigations with timeous results. These include pathology and radiology special investigations. One-quarter of the patients seen required special investigations; these patients could not be managed in a General Practice and had to present to the EC. The majority of patients were discharged. This could indicate that ECs are not used primarily for urgent/emergency care. A large proportion of presentations could likely be seen at primary care/GP level with outpatient special investigations. Of those discharged, only 17% required scheduled follow-up with either a specialist or allied health professional. This is less than 21% requiring follow-up at a public, secondary level, urban EC, but statistical significance was not tested.(11) The majority of patients required no follow-up, or follow-up at the level of the EC. This again indicates that patients often attend an EC more for convenience than for a genuine emergency. Admitted and transferred patients were primarily in yellow or orange categories, and discharged mostly in yellow and green categories.

Disparity in admission rates amongst the hospitals researched could relate to the hospitals' locations and the types of patients seen. Unit 1 is newer than nearby private hospitals, with the latter having an established good reputation. Serious cases would probably go to them. Unit 2 is in the heart of the Cape Flats area and has a higher number of higher acuity presentations. There are only two private hospitals in close proximity to this population group, which has a better socio-economic profile. Unit 3 is the only private hospital in the community it serves. It caters to the poorest of the poor, most of whom use neighbouring public facilities due to high cost of private healthcare. Unit 3 has lower acuity presentations and less specialist cover, which could explain lower admission rate.

7. Conclusion

This study is the first to look at the case mix of patients presenting to a private facility EC. The information harvested allows for comparisons with other private ECs, and also for study of differences between data obtained in private ECs vs those of public ECs. Similarities and striking differences between the two EC's exist.

Differences

- Private ECs have shorter waiting periods in comparison to public ECs
- Private EC's rely on third party funders, where Public EC's do not.
- Private ECs see less red and orange patients
- Larger proportion of green category patients who use these ECs due to convenience

Similarities

- Both have large paediatric attendances

- Surge Patterns are similar for both and it appears as if more serious cases are seen after 10 pm with less green category patients at that time

It could enable planning at private facilities to ensure adequately trained staff, both in paediatric expertise and staffing needs, which adjusts positively to the workload requirements of individual units.

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8. Conflict of interest

None

9. Annexure 1 (next page)

Annexure 1

Study Number				Date of Service :				
Patient Type	New Patient		Follow-up	Triage Only Not Seen				
Payment Method	Medical aid	WCA	Private					
Sex	Female	Male						
Age								
Vitals	BP		Pulse	Temperature	RR	SATS		
Triage Code	Green	Yellow	Orange	Red	Blue			
Triage Priority By	Tews	Discriminator						
Tews Score			Name Discriminator if Used					
Time Folder Opened								
Time of Triage								
Time Seen By Doctor								
Time Patient Left Unit								
Radiology	X-ray	CT	MRI	U/S	Other	None		
Time To Radiology			N/A	Time From Radiology				N/A
Pathology	Yes	No						
Time Bloods Done			N/A	Time Results Available				N/A
ECG	Yes	No						
Time to ECG			N/A					
Time For Trop I Results			N/A					
Time To Start Thrombolysis			N/A	Time To End Thrombolysis				N/A
Thrombolytic Used			N/A					
Time To Cath Lab			N/A					
Intubation	Yes	No						
RSI	Yes	No	N/A					
CPR	Yes	No						
ROSC	No	Transient	Maintained	N/A				
Outcome Of Resus	Successful	Not Successful	N/A					
Diagnosis	Medical	Surgical	Polytrauma	Pediatrics	Orthopedics	Obs & Gyne	Psyc	Trauma
Specific Diagnosis								
ICD 10 Code								
Disposal	Admitted	Transfer	D/C	Died				
If Admitted	Medical	Surgical	ICU	PICU	Paeds			
Time To Ward			N/A	Time To Theatre				N/A
Follow Up	EC	Physio	Specialist	GP	OT	None		

Part C: Addenda

1. Journal instruction to authors

South African Medical Journal

Author Guidelines

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The SAMJ does not hold itself responsible for statements made by the authors.

CONFLICT OF INTEREST

Authors must declare all sources of support for the research and any association with the product or subject that may constitute conflict of interest.

PROTECTION OF PATIENT'S RIGHTS TO PRIVACY

Identifying information should not be published in written descriptions, photographs, and pedigrees unless the information is essential for scientific purposes and the patient (or parent or guardian) gives informed written consent for publication. Informed consent for this purpose requires that the patient be shown the manuscript to be published. (www.icmje.org)

ETHNIC CLASSIFICATION

Work that is based on or contains reference to ethnic classification must indicate the rationale for this.

MANUSCRIPTS

Short items are more likely to appeal to our readers and therefore to be accepted for publication.

Original articles of 3 000 words or less, with up to 6 tables or illustrations, should normally report observations or research of relevance to clinical medicine. References should preferably be limited to no more than 15.

The student project should be no more than 5000 words long. There is no limit to the references that may be listed.

MANUSCRIPT PREPARATION

Research articles should have a structured abstract not exceeding 250 words comprising: Objectives, Design, Setting, Subjects, Outcome measures, Results and Conclusions.

Refer to articles in recent issues for guidance on the presentation of headings and subheadings.

Abbreviations should be spelt out when first used in the text and thereafter used consistently.

Scientific measurements should be expressed in SI units except: blood pressure should be given in mmHg and haemoglobin values in g/dl.

Arrangement of papers

The structure of your report which will resemble the structure required for publication is as follows:

1. title page
2. abstract
3. introduction
4. methods
5. results
6. discussion
7. references
8. acknowledgements
9. tables
10. figures and legends

1. Title page

the title page should be as informative as possible, but should not exceed 150 characters and spaces. Three key words for use in the review process should be provided. The total number of words in the paper, excluding references and figure legends, should be added to the title page. The title page should include a list of the group members as well as the name of the supervisor separately.

2. Abstract

Research articles should have a structured abstract not exceeding 250 words comprising: Objectives, Design, Setting, Subjects, Outcome measures, Results and Conclusions.

Refer to articles in recent issues for guidance on the presentation of headings and subheadings.

3. Introduction and literature review

The introduction should make the background and the object of the research clear. Students should also include a section on the literature review. This section is similar, but should be an expanded version of what had been included in the original protocol.

4. Methods

Methods should be described once only. Start the methods section with a paragraph entitled ethics approval. Details of the ethical approval process should be included here.

5. Results

Students' results are presented here with some discussion as to the statistical processes used. These may be presented in table or other graphical representations.

6. Discussion

The discussion makes sense of the results section. It needs to be the analysis section of what was observed in the results. Do not rehash the results in this section.

Submission Preparation Checklist

As part of the submission process, authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to these guidelines.

The submission has not been previously published, nor is it before another journal for consideration (or an explanation has been provided in Comments to the Editor).

The submission file is in Microsoft Word or RTF document file format.

When available, the URLs to access references online are provided, including those for open access versions of the reference. The URLs are ready to click (e.g., <http://pkp.sfu.ca>).

The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses). Figures consist of all material that cannot be set in type, such as photographs and line drawings. If any tables or illustrations submitted have been published elsewhere, the author should obtain written consent to republication from the copyright holder and the author(s). All illustrations, figures etc. must be of high resolution/quality, preferably jpeg or equivalent but not powerpoint.

The text adheres to the stylistic and bibliographic requirements outlined in the [Author Guidelines](#), which is found in About the Journal.

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2. Ethics Approval letter Human Research ethics Committee

UNIVERSITY OF CAPE TOWN



Faculty of Health Sciences
Human Research Ethics Committee
Room E52-24 Groote Schuur Hospital Old Main Building
Observatory 7925
Telephone [021] 406 6338 • Facsimile [021] 406 6411
e-mail: shuretta.thomas@uct.ac.za
Website: www.health.uct.ac.za/research/humanethics/faq.htm

07 August 2013

HREC REF: 476/2013

Dr Z Moolia
c/o **Dr T Welzel**
Emergency Medicine
Department of Surgery
J46-56, OMB

Dear Dr Moolia

PROJECT TITLE: CASE MIX AND WORKLOAD OF PATIENTS SEEN AT THREE PRIVATE EMERGENCY CENTRES IN CAPE TOWN, SOUTH AFRICA

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year till the 15th August 2014

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/research/humanethics/forms)

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the HREC REF in all your correspondence.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN ETHICS

Federal Wide Assurance Number: FWAC0001637.

Institutional Review Board (IRB) number: IRB00001938

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP) and Declaration of Helsinki guidelines.

The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 312.56 and 312.61.

cc:thomas

3. Protocol Amendment Approval Human Research Ethics committee



UNIVERSITY OF CAPE TOWN
UNIVERSITEIT VAN KAAPSTAD

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

Form FHS006: Protocol Amendment

HREC office use only (FWA00001637; IRB00001938)		
<input checked="" type="checkbox"/> Approved	<input checked="" type="checkbox"/> Type of review: Expedited	<input type="checkbox"/> Full committee
This serves as notification that all changes and documentation described below are approved.		
Signature Chairperson of the HREC		Date 6/9/2013
Note: All amendments should include a Synopsis justifying the changes for the amendment (please see notice dated 23 April 2012)		
Principal Investigator to complete the following:		
1. Protocol information		
Date	02 Sept 2013	
HREC REF Number	476/ 2013	
Protocol title	Case Mix and Workload of patients seen at three private Emergency Centres in Cape Town, South Africa	
Protocol number (if applicable)		
Principal Investigator	Dr Zuraida Moolia	
Department / Office Internal Mail Address	c/o Dr T Welzel, Rm J46-56, OMB, GSH	
1.1 Does this protocol receive US Federal funding?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
1.2 Is this a major or a minor amendment? (see FHS006hlp)	<input type="checkbox"/> Major	<input checked="" type="checkbox"/> Minor

2. List of Proposed Amendments with Revised Version Numbers and Dates

Please itemise on the page below, all amendments with revised version numbers and dates, which need approval.
This page will be detached, signed and returned to the PI as notification of approval. Please add extra pages if necessary.

Appendix 1 : Data capture form V 1.3 Date 2nd September 2013
Appendix 2 : Excel workbook V1.3 Date 2nd September 2013

A summary of changes to Data Capture form is attached to this application form.

4. Study Approval Department of Surgery, University of Cape Town



UNIVERSITY OF CAPE TOWN

Department of Surgery

Departmental Research Committee

Professor Anwar Suleman Mall

J-45 Room Old Main Building, Groote Schuur Hospital,
Observatory 7925, South Africa

Tel (021) 406 6168/6232/6227 Fax (021) 448 6461

Email: Anwar.Mall@uct.ac.za

1st August 2013

Dr Z Moolla
Department of Surgery
Division of Emergency Medicine
Groote Schuur Hospital
University of Cape Town

Dear Dr Mooller,

RE: PROJECT 2013/087

PROJECT TITLE: Case mix and workload of patients seen at three Private Emergency Centres in Cape Town, South Africa

The above proposal was reviewed by the Department of Surgery Research Committee and I am pleased to inform you that the committee approved the study.

I further confirm that the above study does not need Ethical approval.

Please use the above project number in all future correspondence.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Anwar S Mall'.

PROFESSOR ANWAR S MALL
CHAIRMAN: RESEARCH COMMITTEE

"OUR MISSION is to be an outstanding teaching and research university,
educating for life and addressing the challenges facing our society."

Error! Bookmark not defined.

5. Institutional Approval to perform the study

DR ZURAIDA MOOLLA INC

PRAC NO: 0434027

15th August 2013

To whom it may concern

Dr Zuraida Moolla Inc., providing Emergency medical services at the Emergency centres of Melomed Gatesville, Melomed Mitchells Plain and Melomed Bellville, hereby gives consent to Dr Zuraida Moolla to collect data for the case control study to be undertaken from the 1st September 2013 until the 30th September 2013.

Ethical approval has been obtained at the University Of Cape Town , Faculty of health Sciences Human research ethics committee , REF : 476/2013 and is attached.

Yours sincerely
For Dr Zuraida Moolla Inc.



Dr Zuraida Moolla

Practicing At:


MEL • MED
BELLVILLE

Corner of Voortrekker & AJ West Street Bellville
PO Box 446 Bellville 7535
Tel: +27 21 948 8131
Fax: +27 21948 6525


MEL • MED
GATESVILLE

Temple Road, Gateway Centre, Gatesville 7764
PO Box 204 Gatesville 7766
Tel: +27 21 699 0950
Fax: +27 21 699 1023


MEL • MED
MITCHELLS PLAIN

SymphonyWalk, Town Centre Mitchells Plain
PO Box 363 Mitchells Plain 7785
Tel: +27 21 392 3126
Fax: +27 21 392 0119

6. Study Proposal

Abstract

Background

A large number of hospitals in Cape Town belong to the private sector. Not much is known about the case mix of patients presenting to private Emergency Centres.

Aim

The aim of this study is to look at the case mix of patients presenting to three private Emergency Centres, thereby creating an understanding of the operational aspects of private emergency care in Cape Town. The information obtained will be used for planning and improvement of healthcare.

Study design and setting

A prospective cross-sectional observational study will be done at the Emergency Centres of three private hospitals.

Sampling and Study population

Convenience sampling will be employed. All the patients attending the Emergency Centres at three private hospitals for one month will be included.

Data collection and statistical methods

A Prospective Data Capture Sheet will be completed for each patient attending the Emergency Centre at the respective hospitals. Basic statistics will be used, including percentages and proportions, as well means and medians for numerical variables. The 95% Confidence intervals will be calculated for estimation of certain variables.

Background (Literature Review) and Rationale

Emergency Units are an integral part of Health Care in the Western Cape Province and South Africa. The transformation from primarily GP-run

practices to Emergency Centres (ECs) in the last decade has changed the face of Emergency Medicine, concurrent with the growth of the Emergency Medicine Speciality. In South Africa, Emergency Medicine was first registered as a speciality in 2003, and its role is still evolving in both public and private hospitals. There are increasing numbers of Emergency Physicians managing patients in Emergency Centres, with 30 new qualified specialists by 2008.(1) A recent Delphi study looked at Performance indicators in ECs in an attempt to define and initiate quality measures in public and private ECs.(2)

The quantification of the burden of illness of patients seen by ECs is required to integrate resources including recruitment of Emergency Medicine consultants to Health Care facilities. Case Mix and Diagnosis–related groups (DRGs) provide insights in triage outcomes, scope of patients seen and managed, provided that the information that is used to make these distinctions is accurate.(3)

There is a big difference in the nature of private and public ECs. Private healthcare funding dominates in South Africa, with the total expenditure via private health schemes being close to 45%, with 40% from taxation and the remaining 14% from out-of-pocket expenditure.(4) The Public sector spends less on healthcare than similar countries of the same income. The private sector on the other hand has similar resources to those of European healthcare systems.(5)

South Africa consists of both public and private healthcare. Planning for healthcare 2020 requires evaluation of comparisons and relationships between these two systems to understand future roles and partnerships. Athens “demonstrated a positive relationship between healthcare need and utilisation of health services within a mixed public-private health care system.”(6)

The concept of Case Mixes is not a new one internationally and many countries rely heavily on case mix data to make decisions for healthcare

resources and funding. Case mix measures were introduced in the 1970's in the USA. Thereafter, the concept was introduced to a few West European countries and Australia, followed by Eastern Europe and Asia. (7) It has become a priority to find an international case mix grouper tool to develop healthcare, and to describe and compare international systems with each other.

The Australian setting is one in which case mix and DRGs have been used extensively to fund their healthcare system. The limitations of case mix funding must also be looked at as has been done in Australia. In addition the Mix of Morbidities has also been studied to provide information on multimorbidity for planning purposes.(8)

UK based studies of case mix and waiting times have provided valuable information for determining level of service achieved.(9)

A Greek study in 2004 found the *“Emergency Department studied [...] severely overcrowded in relation to the population that it covers. A great part of this overload was directly related to non-urgent cases and inappropriate visits.”*(10) These findings echoed across units the world over before 2004 and since then. In the South African setting, we are faced with overcrowding in many ECs. Some of the local problems may be attributable to inappropriate presentations to the EC. Case mix studies have been used to look at referral patterns of low acuity patients back to primary health care facilities after triage.(11)

Emergency services can be accessed via many avenues in South Africa, ranging from Public 24-hour Community Health Care Centres with “Emergency Units”, Public Secondary and Tertiary hospitals with their own

Emergency Units, and ECs of Private Hospitals. There is limited recent information in quantifying the patients seen at the majority of these ECs. A 2010 review at a more rural hospital in the Western Cape *“showed some important demographic, epidemiological and operational features of an ED in*

rural South Africa.”(12). The study highlighted a large proportion of self-referred patients and a high workload attributed to penetrating trauma. Although the information of this study is relevant, it does not provide all the answers and cannot be generalised to a private hospital In Cape Town.

In distinction, a 2009 review of the trends in patient demographics and temporal attendance patterns at an Urban secondary level hospital in Cape Town provided important information for resource allocation and planning.(13)

The only broader-level review that looked at the patient loads and case mix of patients presenting to units in urban Cape Town occurred in 2007. This cross-sectional study primarily looked at four community health centres to try and attempt to answer some of the questions pertaining to the acuity, case mix and workload of these centres and an attempt to understand a small part of Emergency medicine in Cape Town.(14)

Macro data was assessed in a rural secondary hospital in the Western Cape looking at trends in patients presenting to the EC to determine the reasons why patients went directly to secondary level of service and bypassed primary healthcare services. This highlighted important information in terms of improving the primary healthcare system in George.(15)

The concept of case mix is also being used in South Africa by administrators of healthcare funders such as Discovery Health to look at healthcare expenditure and patterns based on DRGs.(16)

A report of the case mix presentation in Stanger Hospital in KwaZulu-Natal indicated that even though budgets may increase at the correct rate, if the case mix and case change are not take into account, the health needs will not be met adequately. The two have to be married together.(5)

Studies that are able to shed some light on the private health sector, in terms of Acuity Case Mix and level of healthcare services being rendered, are a vital missing link in the establishment of healthcare Services in Cape Town.

Motivation: Why project is worth doing

This project is worth doing because it may provide important information about the types of patients that present to private Emergency Centres in Cape Town. In the South African context, the majority of private hospitals are located in Gauteng and the Western Cape, making the location of the latter setting a good choice.

It will provide a means of quantifying the acuity of patients presenting to these units, and look at the healthcare resources available for the patients presenting. Currently acuity is based on the South African Triage Score (SATS), whereby each patient that presents is triaged and assigned a triage code.

The urban growth rate according to statistics South Africa for 2010 is 1.9%. This does not seem like much; however, it is estimated that in 2011, 62% of the national population was urbanised.⁽¹⁷⁾ There was an average increase of 7, 3% in the average number of patients seen in the Melomed Private ECs between 2012 and 2013. (Appendix 3)

A case mix study will highlight the types of patients seen so that funding and resources are available taking into account the growth, increased patient loads, and increased costs of healthcare and private health schemes curtailing costs.

A case mix study has not been done in private ECs in South Africa. The 2007 case mix study by its very nature only looked at public sector units. This is not transferable to the private healthcare milieu in Cape Town. Due to the disparity between Private and State-run hospitals in Cape Town, the analogy made in that study cannot equate to private health care facilities.

The Western Cape healthcare 2020 plan has highlighted a few important aspects, including affordability of health services, building strategic partnerships, patient- centred quality service and clinical governance. In view of these aspects, it will be prudent for healthcare establishments to understand the role they will play in the healthcare 2020 plan. Private

hospitals that will be involved with government in developing and making the 2020 health plan a success will have to understand and define the current practice and case mix they see to know how they can provide services that integrate with the 2020 healthcare plan.

The goal is to create awareness and focus on the operational aspects of the Emergency Centres and to assist with future planning of the management and running of the Emergency Centres.

Research Question

What is the case mix of patients presenting to three private hospitals in Cape Town with acuity based on the South African Triage Score?

- P: Patients attending Melomed Private Emergency Centres, adult and paediatric
- O: Look at what types of patients attend, acuity, the triage code and final outcome, time to be seen by doctor, time to be given meds, time to be d/c or admitted, time for special investigations
- T: One month

Specific Aims and Objectives

The aims and objectives of doing a study such as this are to determine the case mix of patients presenting to three private emergency centres.

The objectives will be inter alia to determine:

- Basic metrics across all three units over study time
- Triage parameters for patients sample across three units
- Record direct time study of patients through unit
- Doctor-to-patient workloads
- Nurse-to-patient workloads
- Average number of patients receiving special investigations

Methods

Study design

A Prospective Cross-Sectional Observational study will be done to look at core indicators of the case mix presenting to the Emergency Centres in question. A data capture form (Appendix 1) will be completed prospectively for each patient seen during the study period.

Study population and sampling

The study population will include patients attending the Emergency centres of three private hospitals in Cape Town. The three facilities that will be used are the Melomed Bellville, Melomed Gatesville and Melomed Mitchells Plain Emergency Centres. Convenience sampling will be employed and consecutive patients presenting during the required time period will be included. The time period will be a snap shot of one month. The prospective date for collection of data is immediately after approval by the relevant committees.

Approximately 3900 patients are seen at the three hospitals per month. This volume will represent a good estimation of the case mix variation that presents to these emergency centres. The month on month variation is minimal, with numbers increasing each year in each unit. December usually has an expected increase in numbers seen in all three hospitals related to holidaymakers and GP practices closed for business. Apart from this there is a slump noted at Melomed Gatesville and Mitchell Plain in October and

November due to depletion of medical aid funds. September seems to be stable, and a good representation. Data collection will occur from 01 September 2013 to 31 September 2013. (See Appendix 3 for statistics from January 2011 to current time reflecting patient numbers on a month-to-month basis.)

A data capture form (Appendix 1) will be used to prospectively collect the data required for the parameters that will be studied. All the staff members

that will use the form will attend a training session in the standard operating procedure relating to the use of the form. Copies of the completion-of-form procedure will also be made available to the staff and be kept in each Emergency Centre. (Appendix 4).

The form will be piloted before the study for a two-week period. Quality checks and audits will be done at the end of each week. The pilot will be deemed acceptable if the forms reflect greater than 85% of the fields completed correctly. The principal investigator (PI) will perform audits on the data capture sheets and will evaluate to ensure that the correct information is entered, by retrospectively looking at the raw data. Should problem areas be identified, the staff will be retrained, and a further one-week pilot period will be done.

On commencement of the study, the PI will retrospectively obtain any ambiguous or missing data on the data capture sheet from the following relevant documentation: The Trauma Register, Patient Nursing Record, Doctors Record, and Resuscitation Record Book.

Inclusion and exclusion criteria

All patients attending the facilities will be included in the calculations. Patients that are triaged only and not seen in the Emergency Centre by a doctor will be excluded in the analysis, but the total number of these will be listed.

Measurements

95% confidence intervals

Proportions and percentages

Variables: nominal and ordinal

Medians and means, ranges /IQR

Box and whisker plots and Frequency tables

Data management

A prospective data capture form (Appendix 1) will be completed for each patient attending the Emergency Centre during the study period. Information

will be completed by staff that have been duly trained to complete the data capture form (Appendix 1) No patient identifiers will be captured on the form. A list of study numbers will be provided to each hospital's head receptionist. A consecutive study number will be assigned to the nurse for a corresponding patient sticker by the receptionist on duty, which will be placed on the list next to the study number. Completed lists will be kept in a sealed envelope placed in the data collection box for the Principal Investigator (PI) who alone will have access to the decoding list. A sealed data collection box will have a pigeon hole will be kept in each EC so that completed data capture forms can be dropped into the box. The PI will collect the box and provide a new sealed box on a weekly basis on a Friday afternoon after 2 pm.

The data capture forms will be used to complete a Data Analysis Workbook using Microsoft Excel™ 2010. (Appendix 2) Any incomplete or ambiguous data capture forms will be dealt with by the PI going back to the decoding sheet to obtain the missing information. Patient confidentiality will still be maintained. Captured data will be entered twice into the Data Analysis Workbook (Appendix 2) and compared for consistency. Discrepancies will be dealt with by comparing the entry to the original data collection sheet. If there is still ambiguity, the PI will be consulted for the final verdict. If no consensus

can be reached, that entry will be discarded. The Excel file will be password protected and accessible only to the data capture and the PI.

Each data capture form will be kept in a lever arch file, and filed in ascending order of the date of presentation. The lever arch files will be kept in a locked filing cabinet the PI's office, which will be locked when it is not in use by the PI. No other person will have access to the filing cabinet or the office.

The Excel workbook that is to be used for data extraction will be backed up by a USB. The USB will be backed up to an external hard drive. Both of the backup devices will be stored in the locked cabinet in the PI's office.

If triage codes are missing on the data capture sheet, the information will be computed by extracting the required information from the patient record by the PI using the decoding sheet (Appendix 5). If the original data is incomplete and it is not possible to compute the data, then the data will not be used in analysis.

Statistical Considerations, including Data Analysis Plan

Microsoft Excel™ 2010 will be used to capture and analyse the data. The data will be analysed using the triage codes assigned to the patient, even if retrospectively these are found to be inaccurate. If times are missing, this cannot be computed and these patients will be excluded from any time-dependent calculations.

If no discharge times are available on the data capture sheet, nor on the original nursing record, the record will not be used in analysis.

If the handwriting is not legible a second person, independent of the PI will be asked for an opinion. If both persons cannot agree the original patient record will be obtained and any disagreements clarified by looking at the original data. If the original data is illegible, a second independent person will be asked to offer an opinion. If both parties are unable to read the handwriting, the data will not be used in the data analysis.

If original data is not present on the patient records, and the information cannot be computed from what is available, then the data will be excluded in analysis.

Any data that is not used in the analysis will be reported on, and the reasons for its not being used will be reported on as well.

Variables will be described using Summary statistics. Measures of central location such as mean and medians will be used. Standard deviations and Interquartile ranges will be used to indicate the spread of data for the

numerical and ordinal variables used. The 95% confidence interval will be used to estimate the effect of parameters that are being evaluated. An alpha value of less than 0.05 will be used to determine statistical significance. Results will be presented using frequency tables, bar charts, box and whisker plots, and histograms.

Ethical considerations

This is a purely descriptive study. Every effort will be taken to maintain patient confidentiality at all times. The PI and the Data Capturer are the only people that will deal with the completed data capture forms and the Excel data analysis workbook (Appendix 2). No patient identifiers will be collected on the Data Capture form or on the Excel workbook. The Decoding list with patient sticker corresponding to a study number will only be accessible to the PI, and only for purposes of obtaining data that is missing or ambiguous before entry onto the Excel workbook. The principles of research ethics as stated in the 8th revision of the Declaration of Helsinki will be adhered to.

A waiver of signed informed consent is hereby requested, as no interventions will be assigned to persons included in the study. Data will be captured using the Data Capture form and entered immediately after collection of the forms, with no reliance on patient registers. The data will be safe and secure and protected as mentioned in the data management plan above. Personal identifiable data will not be used for data analysis. It will not be possible to associate any clinical findings or personal patient factors with patients seen in the respective units.

The final analysis will anonymise the respective hospitals and all the data will be pooled for discussion purposes. Data will be captured separately for each EC on an Excel spreadsheet in the main Excel workbook. Individual data for each hospital will be provided to the management team at each respective hospital.

Strengths and limitations

The strength of the study is dependent on adequate documentation by staff and adequate completion of the data capture sheet. It has been shown that using a structured form in the Emergency setting improves patient records.(18) The use of a structured prospective form to capture the required data will improve the integrity of this descriptive study.

The period of data collection in September will reflect “normal” patient attendances to the Emergency centres. During this period, the influx seen during December due to increased holidaymakers and closed GP practices will not affect the results. The influx seen during January and March due to patients having funds available in their medical aid schemes will not skew the results. The slump noted in October to November because of depleted medical aid funds will not be reflected in the results. This is supported by the statistics of the three units over the past 30 months (see Appendix 3).

This study looking at Case Mix in private hospitals in Cape Town will be a first of its kind, and its results will provide valuable information. External validity will be limited by the physical location of the units. They are primarily situated in a low socio- economic setting that would make it difficult to generalise the study to all private hospitals in Cape Town. Because the study will look at the case mixes in three different private hospitals, this may improve the generalisability to some extent. The study will be a cross-sectional observational descriptive study, which may introduce observation bias.

The Prospective Data Collection sheet (Appendix 1) may introduce bias in the form of the Hawthorne Effect, due to staff ensuring the forms are adequately completed because they are being watched. Nevertheless, the results should not be greatly influenced by that, as a study such as this requires accurate information for it to be of value. The other extreme of this is that the form may not be completed due to increased workload perceived by staff. Then the PI would have to complete the forms by drawing patient records to ensure completeness of raw data required for the study.

The data that is not going to be analysed due to loss of integrity of the data as discussed in the data management section may also affect the results of the study. This can only be quantified after the study has been undertaken and once it becomes known how much of the collected data will not be used for analysis.

Data dissemination plan

The results of this study will provide important information about patients who attend the ECs of the three private hospitals in Cape Town, and will be made available to their Management Teams. An anonymised comparison will be made between the three hospitals. The results will serve as a platform for future decision-making and planning, and the implementation of processes to improve service delivery and healthcare for patients attending the ECs.

Project timeline

2013 / 2014	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR
EM-DRC	X								
Six-DRC		X							
Ethics		X							
Data Collection			X	X					
Transcribing of Data					X	X			
Data Analysis						X	X		
Compilation of Final Report								X	
Submission									X

Resources and budget

Budget				
July 2013 – March 2014				
Item	Description	Unit cost	N° of Units	Total cost

Consumables				
Specialized services	Bio statistical services	R425/ h	5	R2125
Office supplies, printing & reproduction for data collection	Printing and copies of Data collection sheet	R0.40	4000	R1600
Office supplies, printing & reproduction for reports	Printing	R0.40	250	R100
Research travel				
Travel to sites	Travel costs	R9.60/ km	500	R4800
Other, specify	Data Capturer	R200/ h	16	R3200
Sub-Total				
Total				R11825

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Appendices

Appendix 1: Data Capture sheet

Study Number				Date of Service :				
Patient Type	New Patient		Follow-up	Triage Only Not Seen				
Payment Method	Medical aid	WCA	Private					
Sex	Female	Male						
Age								
Vitals	BP		Pulse	Temperature	RR	SATS		
Triage Code	Green	Yellow	Orange	Red	Blue			
Triage Priority By	Tews	Discriminator						
Tews Score			Name Discriminator If Used					
Time Folder Opened								
Time of Triage								
Time Seen By Doctor								
Time Patient Left Unit								
Radiology	X-ray	CT	MRI	U/S	Other	None		
Time To Radiology			N/A	Time From Radiology			N/A	
Pathology	Yes	No						
Time Bloods Done			N/A	Time Results Available			N/A	
ECG	Yes	No						
Time to ECG			N/A					
Time For Trop I Results			N/A					
Time To Start Thrombolysis			N/A	Time To End Thrombolysis			N/A	
Thrombolytic Used			N/A					
Time To Cath Lab			N/A					
Intubation	Yes	No						
RSI	Yes	No	N/A					
CPR	Yes	No						
ROSC	No	Transient	Maintained	N/A				
Outcome Of Resus	Successful	Not Successful	N/A					
Diagnosis	Medical	Surgical	Polytrauma	Pediatrics	Orthopedics	Obs & Gyne	Psyc	Trauma
Specific Diagnosis								
ICD 10 Code								
Disposal	Admitted	Transfer	D/C	Died				
If Admitted	Medical	Surgical	ICU	PICU	Paeds			
Time To Ward			N/A	Time To Theatre				N/A
Follow Up	EC	Physio	Specialist	GP	OT	None		

Appendix 2 - Database Layout

No
Date of Service
New Patient
Follow-up
Triage Only Not Seen
Medical aid
MCA
Private
Female
Male
< 6 weeks
6 weeks - 1 year
1 – 5 years
5 – 12 years
> 12 years
Systolic BP
Diatolic BP
Pulse
Temperature
RR
SATS
Green
Yellow
Orange
Red
Blue
Tews
Discriminator
Tews Score
Name Discriminator if Used
Time folder opened
Time of triage

Appendix 2 - Database Layout

[illegible]

	Surgical	If Admitted	
	ICU		
	PICU		
	Paeds		
	Time	Time to ward	
	N/A		
	Time	Time To Theatre	
	N/A		
	EC	Follow Up	
	Physio		
	Specialist		
	GP		
	OT		
	None		

Appendix 3:

These are the statistics of the three units studied. It represents information which may be sensitive and not for dissemination. This information will be made available upon request should it be required.

Appendix 4: Standard operating procedure for completion of data capture form

Standard Operating Procedure No.	1
Revision No:	1
Original Date of Issue:	1 Aug 2013
Revision Date:	25 th August 2013
Approved by:	Dr Z Moolla

Background:

A prospective Case Mix study will be done using the Data Capture forms for data collection purposes. The study will be done over a period of 1 month for each patient attending the Emergency Centre starting on the 1st September 2013 at 00h00 until the 31st September 2013 until 23h59

Purpose:

To provide instruction on completion of the data capture form

Related Standards and Procedures:

All fields on the form must be completed

Not applicable can only be indicated if it is available as an option on the form

A study number sticker must be placed on each form

No patient sticker with demographic details or patient identifier must be placed on the form

Legible hand writing will be appreciated

Every patient seen during the study period must have a form completed

Procedure:

- Each patient must get a new Data Capture form
- The receptionist will put a sticker with the study number on the data capture form and a duplicate study number sticker on the decoding list.
- The Receptionist will place a patient sticker containing the demographic details next to a corresponding study number on the decoding sheet.
- All fields on the form must be completed with a pen. No pencils may be used.
- If options are provided a cross must be placed in the corresponding correct block. More than one block may be completed for certain fields.
- In the specific diagnosis field the most correct diagnosis at time of discharge from the Emergency Centre must be written in full.
- ICD 10 codes must be added in the appropriate fields and if more than one is available then this should be provided as well.
- Times must be completed in all the requested fields.
- Completed forms must be placed in the sealed Data collection Box
- Any queries or problems can be brought to the attention of the principal Investigator, Dr Zuraida Moolla contactable on 0722800559 or via email on drfish79@mweb.co.za

Related Forms and documentation:

- Data Collection form
- Decoding list

Appendix 5: Sample decoding list with study numbers

<u>Patient Sticker</u>	<u>Study Number</u>
	MB001
	MB002
	MB003
	MB004
	MB005
	MB006
	MB007
	MB008
	MB009
	MB010

<u>Patient Sticker</u>	<u>Study Number</u>
	MB011
	MB012
	MB013
	MB014
	MB015
	MB016
	MB017
	MB018
	MB019
	MB020